PUBLIC WORKS

June 1955

CITY, COUNTY AND STATE

ALGAE OF IMPORTANCE IN WATER SUPPLIES
With 4-color plates
Pages 107-120

Aerial Mapping for Better Public Works 121

Odor Control at a Sewage Treatment Plant 124

The Millipore Filter In Water Works 129

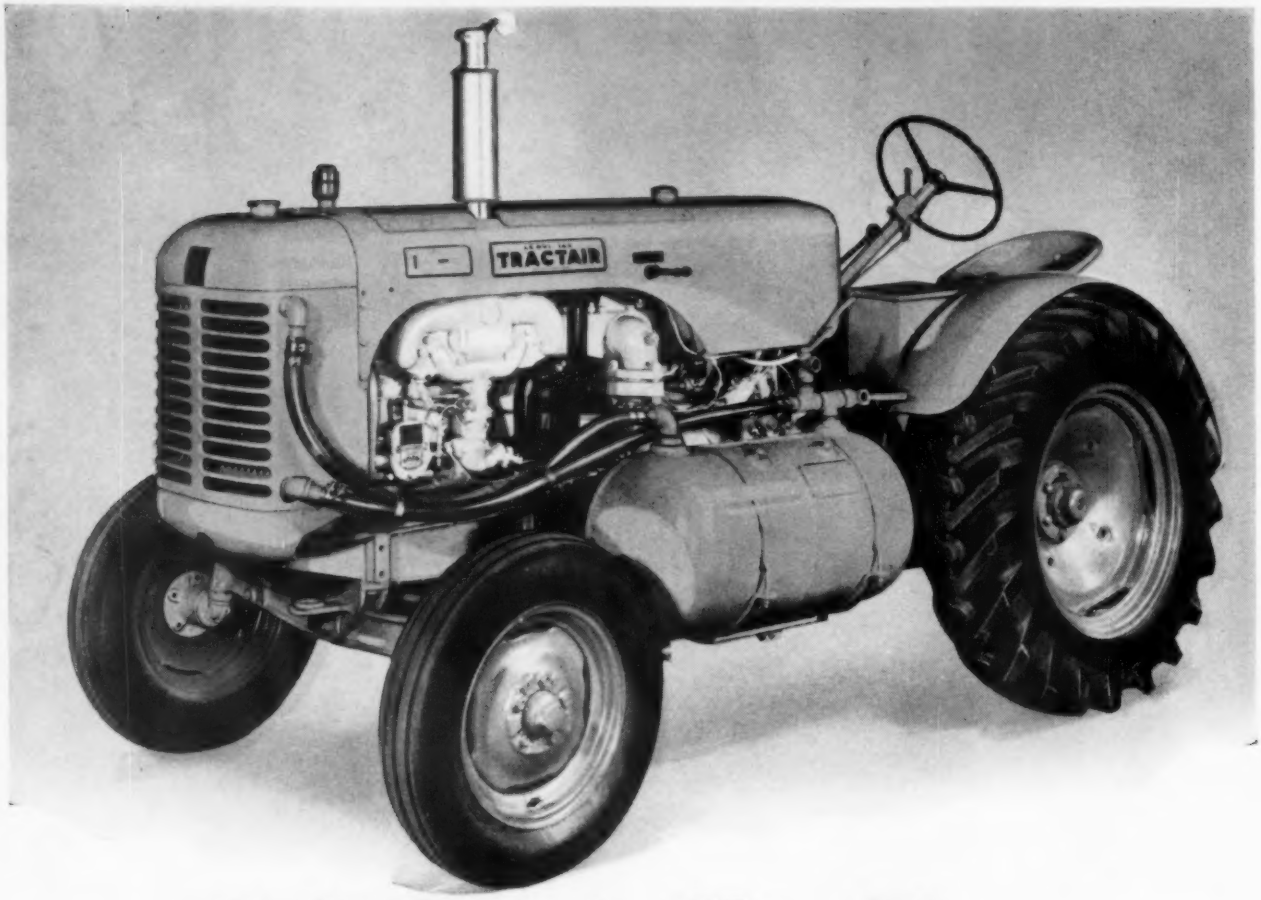
Road Rating Methods And Procedures 131

Taste and Odor Control At Hammond 140

Engineering Procedures For a Swimming Pool 145

COMPLETE CONTENTS LIST ON PAGE 5

Lewis W. Kloekner, Chief Engineer and Superintendent of the Trenton, N. J., Water Department, was a moving spirit behind the fine new filter plant recently built there. More information about him on page 24.



Still More for Your Money

...Le Roi Tractair compressed-air output is increased from 105 cfm to 125 cfm

For the past ten years, the Tractair unit has been making friends and cutting costs on jobs everywhere. Now, with its increased capacity, it is even more productive.

Tractair is still a combination 35-hp wheel tractor and compressor. But now it produces 125 cfm, instead of 105 cfm of air. It will run an extra breaker, tamper, spader, etc. And it has the mobility to take this extra air power almost anywhere you need it without tying up either trucks or men.

Other new features of the 125 Tractair unit are: Econotrol — which varies engine speed to match air demand and promotes longer engine life. An aftercooler — which reduces the temperature and moisture content of the air so that air hose lasts longer — tools run better.

The 125 Tractair unit can be fitted with attachments, too, so that it can be used for loading, backfilling, digging, sweeping, hoisting, tamping and drilling.

There has been no change in the list price. This, plus Tractair's multi-purpose usefulness means that you get still more for your money.

Let your Le Roi distributor show you how the Tractair unit can cut your costs. A new bulletin is available — just write for your copy.

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 14, Wisconsin

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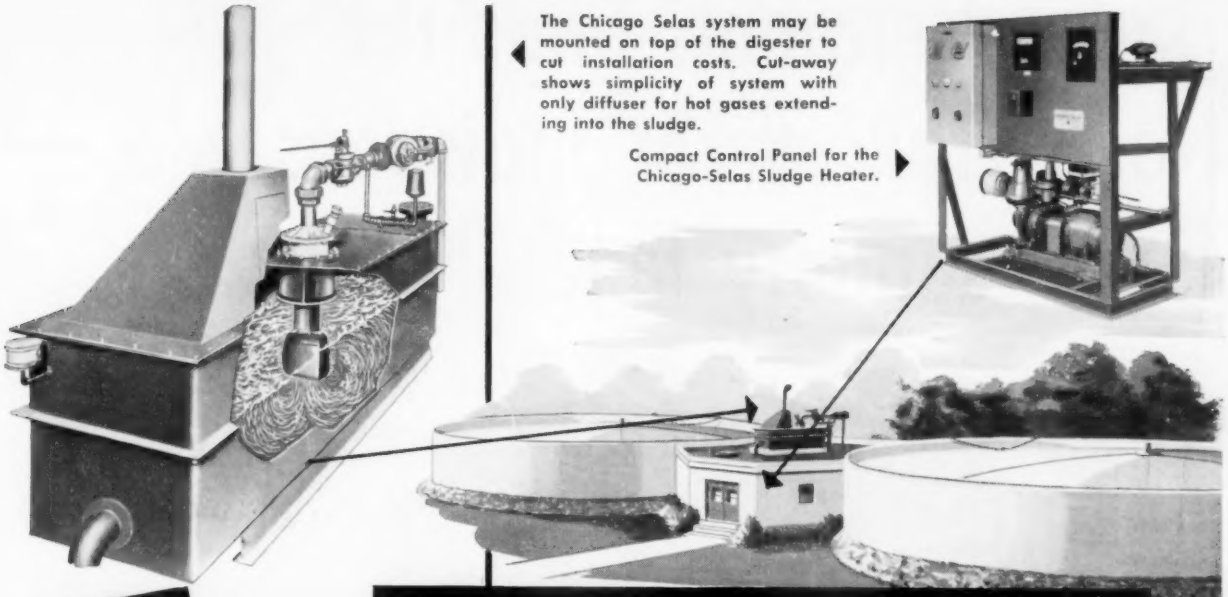

The Chicago Selas system may be mounted on top of the digester to cut installation costs. Cut-away shows simplicity of system with only diffuser for hot gases extending into the sludge.

Compact Control Panel for the Chicago-Selas Sludge Heater.

CHICAGO SEWAGE EQUIPMENT

Chicago-Selas
HEAT TRANSFER SYSTEMS
for Sludge-Heating

CHICAGO-SELAS . . .

Two Experts Teamed Up to Serve You Better

The principle of direct heat transfer, developed by the Selas Corporation of America, has found wide acceptance in industrial applications. Together with Chicago Pump Engineers, this principle has been applied with great success to sludge heating. The efficiency and operating advantages of this form of sludge heating have been well demonstrated, first at the City of Philadelphia and at other treatment plants throughout the country.

Write to Dept. G.

MAXIMUM EFFICIENCY — One pass through the small heat transfer tank boosts sludge temperature 10 to 20 degrees F. Approximately 90% of heat available in the digester gas is transferred directly to the sludge.

LOW COST INSTALLATION — Heater and transfer tank may be located at digester, requiring minimum piping and valves.

NO HIGH COST OIL STAND-BY EQUIPMENT—Operates efficiently on nationally available manufactured gas if necessary. A single control valve is the only stand-by equipment required. Low gas consumption makes Chicago-Selas system ideal for medium sized plants with limited gas production.

UNIFORM HEATING — Agitating action of heated gases expelled into transfer tank assures complete heating of all sludge.

MINIMUM MAINTENANCE — Heat is distributed without mechanical equipment in the tank. No sludge tubes to cake—no cleaning.

PRECISE TEMPERATURE CONTROL — All gas control and safety equipment is approved by Associate Factory Mutual Fire Insurance Companies.

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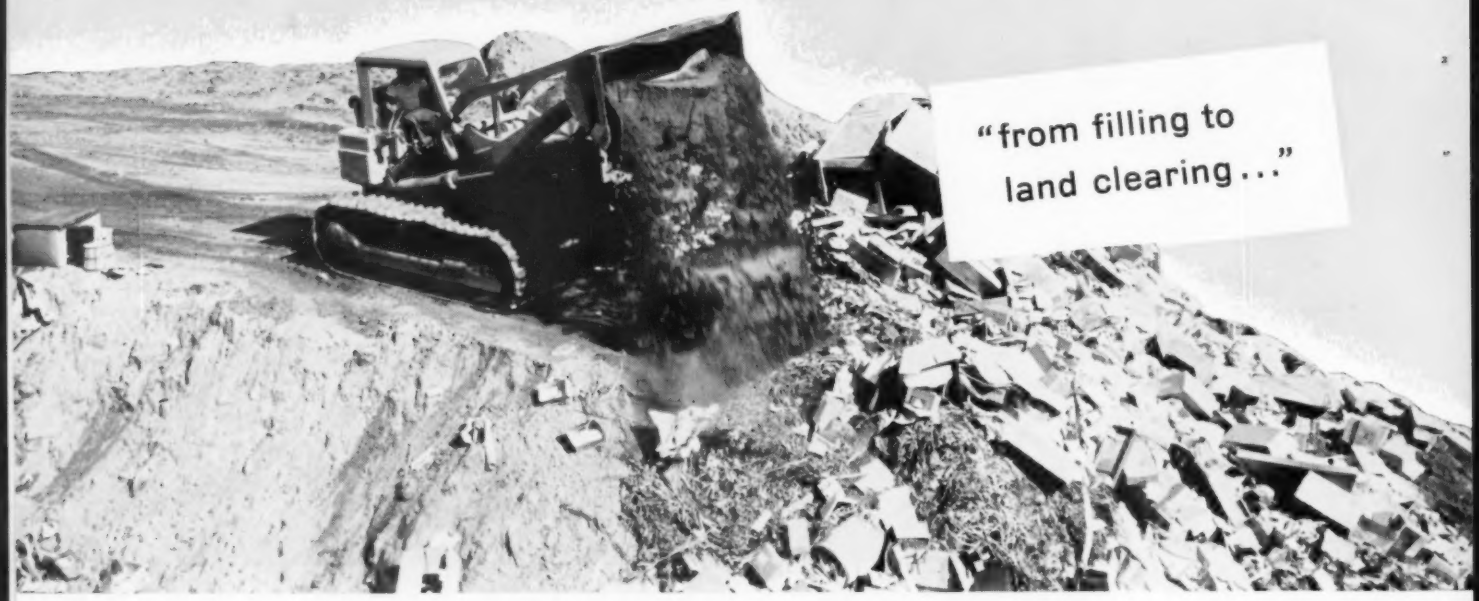
Flush Kleen ®, Scru-Peller ®, Plunger. Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers . . . Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Barminutor ®, Comminutors.

Now's the time to mail this month's Readers' Service card.

Barre, Vermont, finds the No. 6 Traxcavator* indispensable for its sanitary landfill



Barre, Vermont, is using the modern, economical way of disposing of its refuse—*sanitary landfill.* And the equipment that keeps costs modest is the versatile Caterpillar No. 6 Traxcavator—the only equipment on the job!

Explains Jack G. Dutton, manager of the project:

"The Traxcavator handles the *entire* operation from filling to land clearing. And it is doing a very satisfactory job."

Up to 300 trucks and cars empty rubbish daily at Barre's 11-acre disposal area. The CAT* No. 6 Traxcavator bulldozes the rubbish into place, crushes it, covers it with a layer of clean earth, and compacts it. Eventually the once useless, unsightly dump will be a modern housing project.

Here is a simple, sanitary way of getting rid of refuse. Land is reclaimed for playgrounds, parks, or housing projects. Disease-carrying vermin are eliminated. Collection costs are lowered. There is no smoke or nauseating smell.

And the entire job is done by the all-purpose No. 6 Traxcavator. What a convenient tax-saving machine it is for a municipality! This unit can handle excavating jobs from initial digging to finished grading. It can be used as a fork lift. It can bulldoze. And it can clear snow and load trucks.

Barre has solved its refuse problem. If you would like further, detailed information on how you, too, can eliminate your town "plague spot," fill in the coupon. List your town's population and you'll receive details describing how a town like yours is using sanitary landfill to turn wasteland into useful property.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Cat, Caterpillar and Traxcavator are registered trademarks—®

CATERPILLAR TRACTOR CO., Dept. SL-1, Peoria, Illinois

Gentlemen: Please send me full details on sanitary landfill.

Name _____ *Title* _____

Street _____

City _____ *Zone* ____ *State* _____ *Population* _____

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PUBLIC WORKS MAGAZINE

CONTENTS

June, 1955 **Vol. 86, No. 6**

Algae of Importance in Water Supplies. By *C. Mervin Palmer and Clarence M. Tarzwell. Illustrated by Harold J. Walter* 107
Aerial Photomapping as Applied to Public Works. By *Bernard J. Colner* 121
Controlling Sewage Plant Odors. By *John N. Lesslie* 124
Functional Design for a County Highway Maintenance Building. By *K. R. MacDonald* 127
A Remarkable Development in the Control of Water Quality. By *Walter W. Kenyon* 129
Ratings for Rational Road System Evaluation and Planning. By *H. E. Carlson and G. E. Nichols* 131
It's Cheaper by the Gallon. By *Eskel Nordell* 137
Outstanding Improvements Include Modern Treatment Plant 139
Better Taste and Odor Control Results in Chemical Savings. By *A. G. Giannini* 140
Sealing Program Makes Better Playground Areas 143
Engineering a Swimming Pool. By *Herbert Feitler* 145
Speeding Up Traffic Line Marking. By *C. E. Wright* 148
Off-Street Parking: Problems and Remedies 149
A County Highway Weed Control Program. By *L. N. Price* 156
Water and Sewer Services and Charges in Colorado 168
Water Main Repair Unit 176
Yellow Fever—Its Present Status 184
Massachusetts Rainfall in 1954 187
Insect Control for Texas Roadside Parks 194
Organisms Resembling P. tularensis Isolated from Water. By *Carl L. Larson, William Wicht, and William L. Jellison* 203
Tree Trimming, Tree Removal and Roadside Mowing 210

PUBLIC WORKS DIGESTS

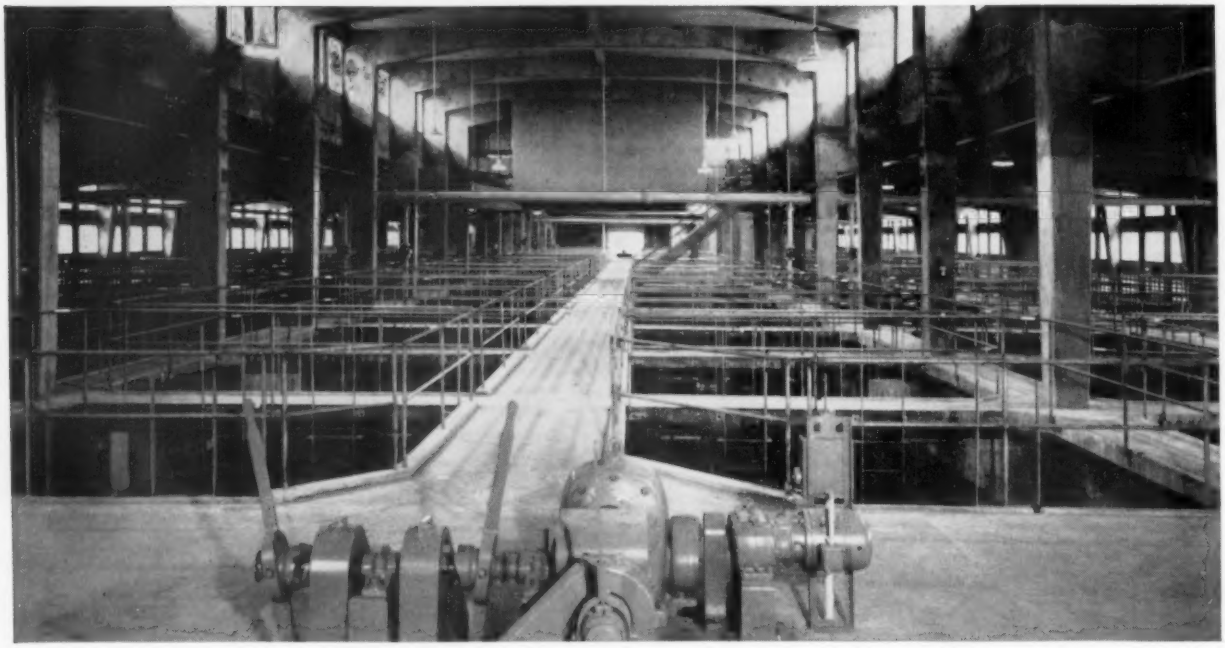
The Industrial Wastes Digest 180
The Sewerage and Refuse Digest 188
The Water Works Digest 196
The Highway and Airport Digest 204

DEPARTMENTS AND SECTIONS

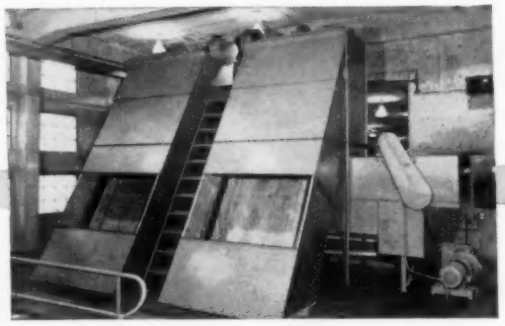
The Editor's Page 7
Leaders in Public Works 24
Letters to The Editor 26
Books in Brief 26
Up Front for Adequate Roads. By *"Jack" Ritter* 30
Engineers Wanted 34
The Engineers' Library 42
Public Works Engineering Data 68
People, Ideas and Events. By *"Doc" Symons* 86
APWA News 151
Washington News Letter 162
New Public Works Equipment 216
Worth Seeing 223
Worth Telling. By *A. K. Akers* 224

THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

VISIT OUR BOOTHS 110-111 — AMERICAN WATER WORKS ASSOCIATION — CHICAGO, ILL. — JUNE 12-17



At North Point plant, opened in 1951, three of the six pre-aeration settling tanks—each equipped with two Link-Belt Straightline longitudinal sludge collectors and one cross collector—are shown above. By combining pre-aeration and settling in the same tank, system cuts construction costs, improves efficiency. Two Link-Belt mechanically cleaned bar screens (right) remove large solids at Southeast treatment plant. Sludge from here and that pumped six miles from North Point are both treated at the new Southeast sludge plant.



San Francisco gets a clean water front

Pre-aeration and LINK-BELT equipment provide top efficiency, low cost at two new sewage plants

After 100 years of discharging raw sewage into the Bay and the Pacific, San Francisco built its first treatment plant in 1939. This Richmond-Sunset Works was equipped with Link-Belt grit and sludge collectors, bar screens, mixers, gates and conveyors.

So satisfactory was the Link-Belt equipment's performance that, when two new sewage treatment plants were planned, San Francisco again relied on Link-Belt. In the three plants, Link-Belt equipment helps treat an average design flow of 110 mgd, with a peak capacity of 260 mgd.

If you're planning new sewage, water or industrial waste treatment facilities—or the enlarging of existing capacity—find out how Link-Belt's broad line of quality equipment can serve you. Our engineers will work with you, your chemists and consultants—help you get top efficiency at lowest overall cost.

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,427

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SANITARY ENGINEERING EQUIPMENT

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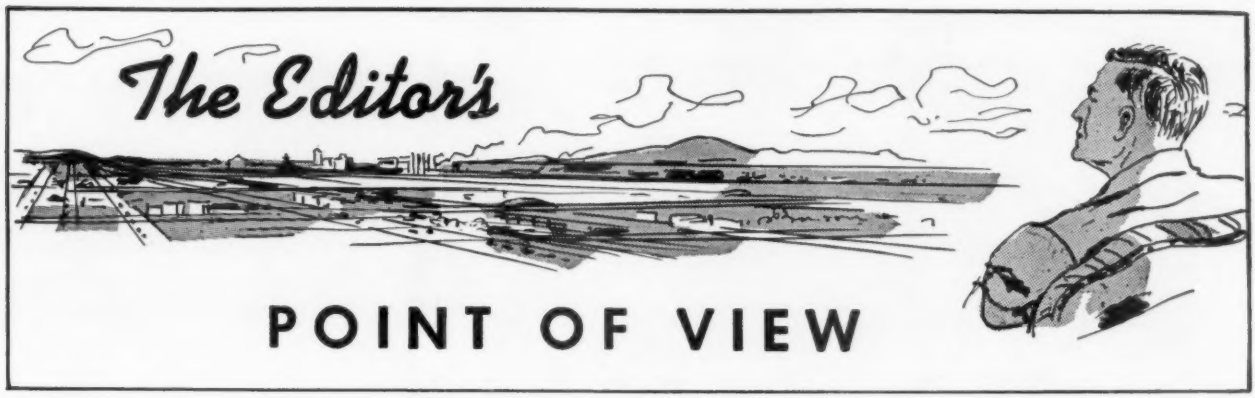


A Civil Defense Project That Would Be Much Worth While

MICROFILMING of all property records and deeds is being carried on in some cities as one of the measures for civil defense. This is fine in a way, but it seems to us that this means that we will never, even after the possible atom bomb, be able to do anything about making our cities better. We will simply perpetuate the conditions that today are causing municipal strangulation and increasing civic, social and economic problems.

A Civil Defense project that would be worth while would be to make a plan of the way the city ought to be rebuilt and then microfilm this and file it with the property records. This could go into just as much detail as funds will permit; but at least it ought to point out a better way than merely building our present mistakes over again.

A Fine Type of Memorial for a Fine Water Works Man

LAST fall the Upper Peninsula of Michigan lost a man who had been a leader in the water field in that area—J. F. Rubbo, Superintendent of Water Filtration at Iron Mountain. The water works men in that section have collected enough money to purchase some laboratory testing equipment. This will be placed in the proposed sanitary laboratory at Michigan Tech and will be available not only for students at Tech, but also for the annual 3-day water works school. This is a fine and realistic type of memorial for a man who devoted his life to public service in the water works field.

An Engineering Job is for Engineers To Do

WHEN it comes to designing engineering structures, an engineer should be consulted; for good building design and appearance, an architect should be called in. The architect who tries to design an incinerator, a sewage treatment plant or a highway is in the same category as an engineer who tries to design a hospital.

We bring this up because we have heard that in the mid-west, on some occasions, architects have been retained to design incinerators. We hope this is not true; and we would like to emphasize for the benefit of everyone that a handsome exterior—which we are very much in favor of—does not mean a good incinerator. The design of incinerators is almost a science all its own.

Concrete and steel built into a structure represents money that can never be recovered; it is gone forever. All we can hope for is that we can get maximum returns in sanitation, in economical and low-cost service, and in community satisfaction from it. This inescapable fact points up the need for getting always the finest engineering skill and the best materials and equipment possible.

The Growing Appreciation of Present Day Water Requirements

ONE of the laws enacted by Indiana at the recent session of the legislature provides that "water in any natural stream, lake or other natural body of water . . . which may be applied to any useful . . . purpose is declared a natural resource and public water of the State . . . and subject to control and/or regulation for the public welfare. . . ."

With the increasing need for maximum utilization of all water resources, more legislation of this type is needed; and no doubt other states will do what Indiana has done. Water is indeed a natural resource and, as such, it should be conserved for the public welfare.

Science Permits Roadside Weed Control to Meet Today's Traffic Needs

WITH the season almost on us when every roadside bursts out with brush, weeds and grass—often reducing roadway sight distances dangerously—we can be thankful that modern science has cut this problem down to size. It was not so long ago that brushing and mowing represented a sizeable piece of the maintenance budget. Now, thanks to our knowledge of chemistry, we can keep roadsides clean and safe at a moderate cost. And with the greater volumes of high speed traffic using our highways today, adequate sight distance is an essential. Time now to get busy on those roadsides and make them safe.

TOPS for strength,

For jobs, where long life is a *must*, you can specify cast iron pipe with confidence. Confidence in its strength and toughness—its ability to withstand beam-stresses, traffic shock, compressive loads—its proved long life over a history running into centuries. The factors which endow cast iron pipe with its great durability are also the factors which mean negligible repairs and maintenance costs. When the job calls for *permanence*, specify cast iron pipe. For further information, write Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3.

CAST Q IRON

The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

Installing cast iron pipe for discharge lines from water circulating pump house to refinery units of oil refinery in middle west.

Mechanical joint cast iron pipe being installed for gas main in Milwaukee, Wis.

CAST IRON PIPE

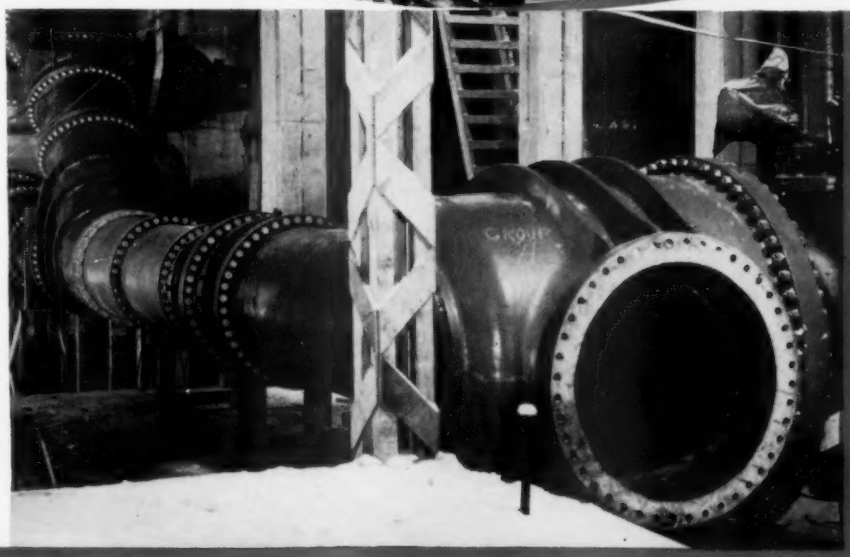
Now's the time to mail this month's Readers' Service card.

toughness and long life

Installing 18" Flexible Joint cast iron pipe for sewer line from mainland to Sherman's Island, Panama City, Florida.

36" cast iron cement-lined pipe for discharge header from pump house to main transmission line in water supply system of Houston, Texas.

Installation of cast iron pipe and fittings in large filtration plant in Chicago, Ill.

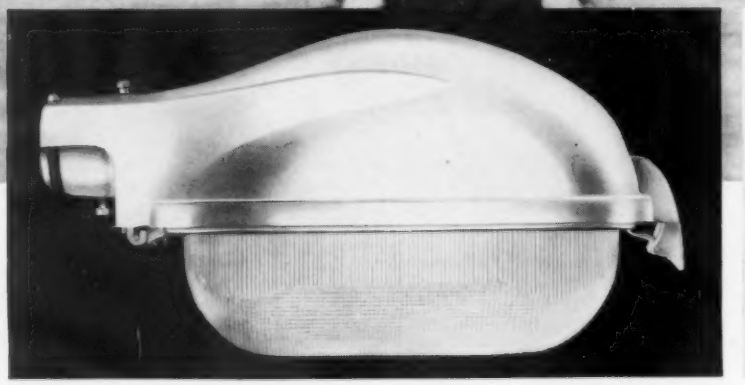


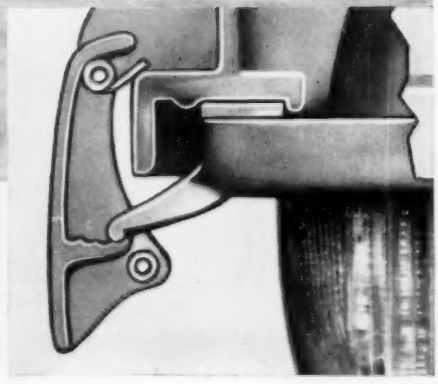
SERVES FOR CENTURIES...

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

Now's the time to mail this month's Readers' Service card.

A typical example of Westinghouse street and tunnel lighting. OV-20's in the foreground, FU-72 luminaires in the tunnel.





Automatic latch (upper right)—As globe closes, latch locks in position. Built-in, double-torsion spring provides driving power for latch. Leaf spring on hinge side provides upward pressure, seating globe tightly against gasket.

Get full details of this month's products . . . mail your Readers' Service card today.

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

Why Seattle specified Westinghouse OV-20 luminaires on their new freeway

Problem: Select a street light that would give Seattle drivers the best possible night visibility on the new Alaskan Freeway and smooth good looks by day. A point-by-point analysis showed Westinghouse OV-20 mercury luminaires to have these qualifications as well as the following superior mechanical construction and maintenance features.

One-piece cast aluminum housing—adds rigidity and weather resistance to the OV-20.

New optical system—New reflector and refractor design improves distribution of light along the street.

Weatherproof seal—between the housing and glassware, holds cleaning to a minimum.

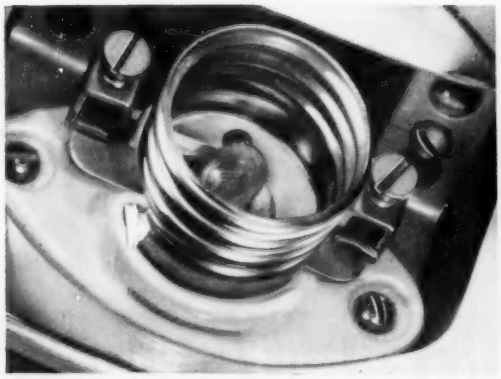
One-hand maintenance—Cleaning, washing and relamping can be done without tools, and without exposing the wiring or damaging the stationary reflector. Open-type latch makes it impossible to drop glassware while cleaning.

Smooth good looks—Mounted on either concrete or metal poles, the modern unbroken design of Westinghouse mercury luminaires adds a progressive appearance to large communities and small.

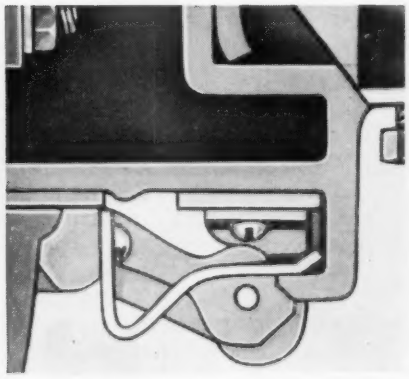
And the Westinghouse OV-60, second member of the mercury family, gives wide streets better visibility and greater uniformity of pavement brightness—with all the plus features of the OV-20.

Be sure you specify Westinghouse OV-20 mercury luminaires—the original mercury street light—copied in general appearance but never duplicated in performance. More information? See your nearby Westinghouse representative. J-04379

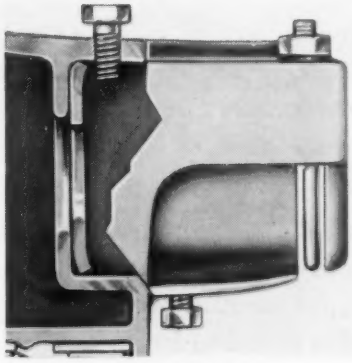
YOU CAN BE SURE...IF IT'S Westinghouse



Pressure-type terminal makes sure of a tight connection without damaging the conductor. Unnecessary maintenance expense is minimized by this construction.



Open-type hinge speeds cleaning time. To remove glassware, swing back and lift out. This design feature makes maintenance quick and easy.



Bug-proof wiring—Offset pipe stop shoulder, inside slip fitter, prevents entrance of water. Felt gasket on pipe stop eliminates dirt and bugs.

Need more facts about advertised products? Mail your Readers' Service card now

How Knox County Practices

225 CUBIC YARDS OF REFUSE pours into the disposal site daily from private collectors. There it is picked up by a TD-14A INTERNATIONAL DROTT Bullclam and moved to the gullied area on the farm.

COMPACTING THE RUBBLE is an operation that only requires minutes as the curve on the closed Bullclam blade crushes and irons the refuse into a dense mass.

Bullclam Method of Sanitary Fill operates on self-supporting basis, converts worthless, eroded Tennessee farmland into lush pastures

The Knox County Health Department, Knoxville, Tennessee, uses refuse from an estimated 110,000 population to reclaim eroded farmland near that city.

County officials adopted the Bullclam Method of Sanitary Fill back in 1951. A TD-14A INTERNATIONAL DROTT Bullclam was put to work burying 225 cubic yards of refuse daily, in gullied areas on farms in the southwest section of the county.

Results to date: Five acres of worthless, eroded farmland reclaimed and converted to lush pasture, reclamation work presently under way on gullied section of second farm.

From the outset, the operation has been self-supporting, since a 25-cent monthly fee is collected by the county from each customer serviced by the private collectors.

Whether your community is interested in reclaiming farmland, building playgrounds or industrial sites on marshy areas, or simply in disposing of waste materials safely and for lowest cost, an INTERNATIONAL DROTT Bullclam does the job best. A demonstration by your INTERNATIONAL Industrial Power Distributor will provide proof. Call him today.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS
DROTT MANUFACTURING CORP., MILWAUKEE 8, WISCONSIN

INTERNATIONAL HARVESTER

INTERNATIONAL®
DROTT

Thousands use our Readers' Service card to keep up to date . . . do you?

Reclamation with Refuse

COVERING THE WASTE is accomplished by application of a two-foot earth seal. Only dirt required for cover coat is excavated and moved swiftly to the fill where it is spread evenly to safeguard against rodents and insects breeding here.

"EASIER TO WORK THAN A KNIFE AND FORK"

Amazing New INTERNATIONAL DROTT 4-in-1 Skid-Shovel Converts Into a

● BULLDOZER ● BULLCLAM ● SKID-SHOVEL ● CLAMSHELL

With the convenient hydraulic control lever, the operator can select the digging tool to suit any type of earthmoving job . . . instantly, while the tractor is in motion or standing still.

Never before has one machine been able to do so many municipal jobs so well and for as little cost as the new INTERNATIONAL DROTT 4-in-1 Skid-Shovel.

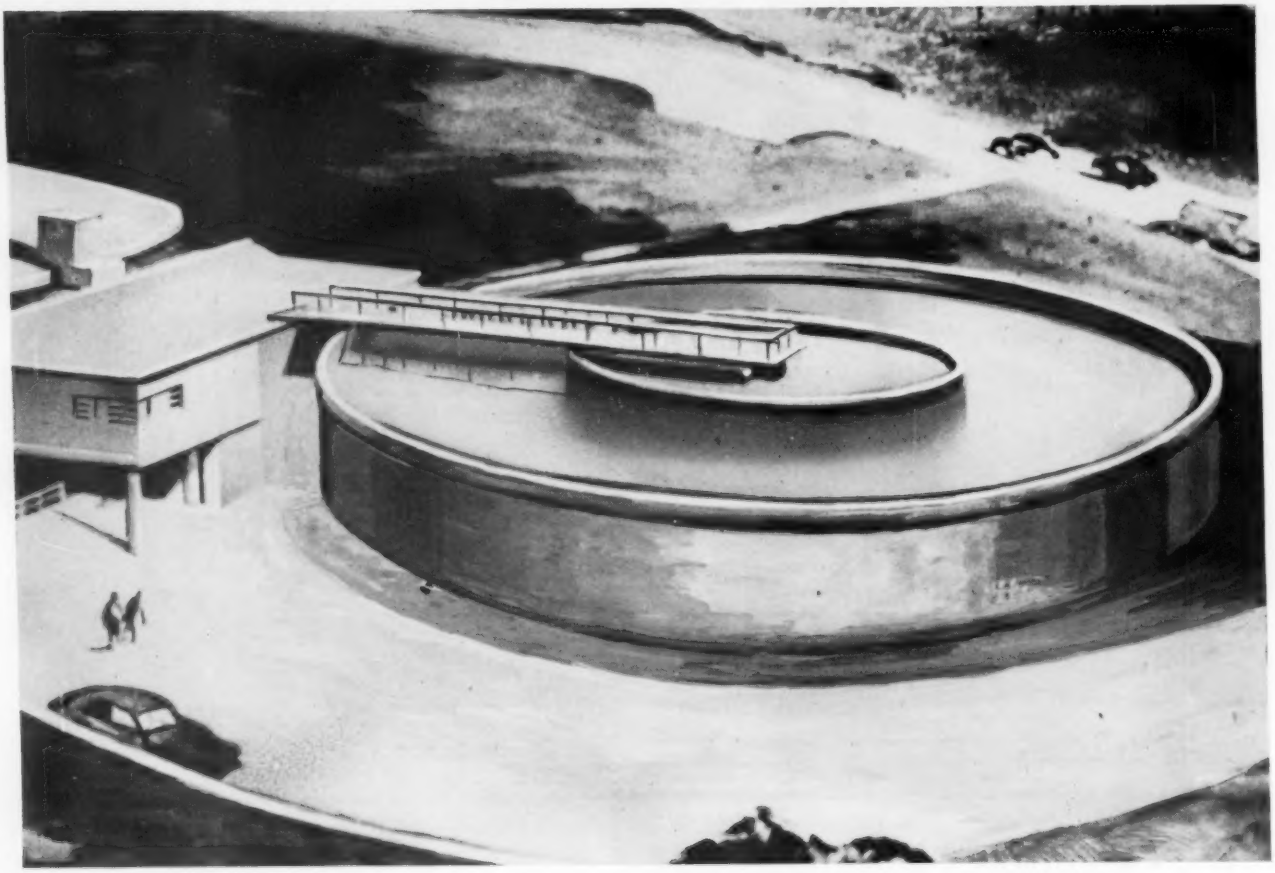
Roy Lewis, a superintendent for the McKenzie Construction Company, has been giving the amazing new TD-6 INTERNATIONAL DROTT 4-in-1 Skid-Shovel "the works" for the past several months on a Dallas sewer job and he makes this report:

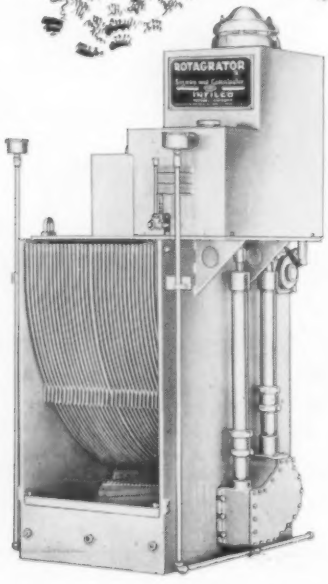
"It's easier to work than a knife and fork. We've dozed, dragged, hauled, loaded and scraped with it. Even put teeth on the bucket and ripped into hard rock 30 days without breaking a tooth. It's so efficient, I believe it could unbutton your shirt."

See it in action by calling your INTERNATIONAL Industrial Power Distributor. He'll show you how it can be used as a Bullclam for a Sanitary Fill project—and on scores of other jobs your community needs done for lowest cost. The hydraulic "shovel selector" converts it into a Bulldozer, Skid-Shovel, Bullclam or Clamshell . . . right from the operator's seat.

SOMETHING SPECIAL. New INTERNATIONAL DROTT 4-in-1 Skid-Shovel performance on city sewer job prompted superintendent to remark, *"It's far ahead of the times."* Can also be used efficiently on sanitary fill operations.

AERO-ACCELATOR (Trade Mark) Treatment Plants provide complete sewage treatment at lower cost!





The "AERO-ACCELATOR" treatment units provide high rate sewage treatment (overall BOD reduction better than 90%) at *low cost*. Embodying the latest concepts of activated sludge processing and solids separation, this compact unit requires a detention time of only 4 hours at average flow for complete secondary treatment. This means important savings for any community or institution, regardless of plant capacity.

If you are planning a sewage plant, see your consulting engineer or write INFILCO regarding the economical "AERO-ACCELATOR" treatment unit.

NEW ROTAGRATOR® screen and comminutor

A revolutionary development for screening and comminuting *all* coarse sewage material without rejection or removal from the flow. Reduced head loss, straight-channel installation and low power requirement. Eliminates odor and handling nuisances.

INFILCO

The one company offering engineered equipment for all types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.

INFILCO INC.

919 South Campbell Ave., Tucson, Arizona

Field offices in principal cities in North America 5531

Now's the time to mail this month's Readers' Service card.

Grandpa thought he was saving money...

"Yes, dear, 25 years ago grandpa was on the Water Board when they ran the pipe line out Madison Street to Western Heights. Grandpa and the other members voted to buy a substitute for cast iron pipe—they thought they were saving money. Now this pipe has failed entirely after years of expensive maintenance caused by breaks and leaks.

"Tonight we're letting a contract to replace that pipe. As Water Board chairman, I'm going to recommend the purchase of Clow Cast Iron Pipe—a pipe with a *proven* record of long service and low maintenance expense. It might cost a little more now than substitutes do, but it will be much less expensive in the long run. You might say that cast iron pipe is the taxpayer's friend—and Clow centrifugally cast pipe is the most economical of all. What's more, we've talked to other waterworks officials and Clow has a wonderful reputation for consistent high quality and excellent service."

Clow Cast Iron Pipe meets all currently approved specifications now in existence. Write today for factual information and case histories on Clow's 75-year-old reputation for economy.

JAMES B. CLOW & SONS

201-299 N. Talman Ave. • Chicago 80, Illinois

Subsidiaries: Eddy Valve Co., Waterford, N.Y.
Iowa Valve Co., Oskaloosa, Iowa

CAST IRON

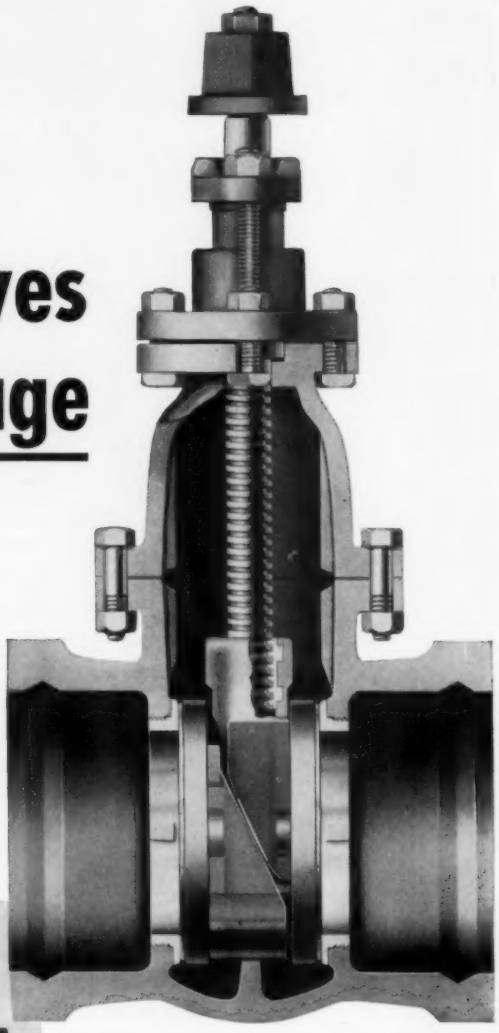
Get full details of this month's products . . . mail your Readers' Service card today.

Need more facts about advertised products? Mail your Readers' Service card now.

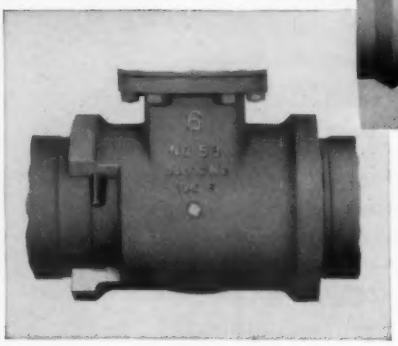
TRADE DARLING MARK

water works valves offer a 3-star advantage

★ *Outstanding performance*
★ *Long life*
★ *Complete selection*



Above: Cutaway of Darling Water Works Valve showing unique fully revolving double disc parallel seat principle, noted for long life, minimum maintenance and drop-tight closure.



Left: Mechanical Joint and Ring-Tite Joint . . . just two of the various valve ends available on Darling Valves.

DARLING'S topmost quality plus the Darling *fully revolving double disc parallel seat principle*, gives you an unbeatable combination.

The cutaway view shows Darling's simple gate arrangement with its plain no-pocket discs and wedges. These unique features, greatly lengthen disc and seat life, minimize maintenance and assure easy, tight closure and long life.

Conforming to A.W.W.A. specifications and available in sizes for your particular service, these valves are equipped with ends designed to meet your installation needs.

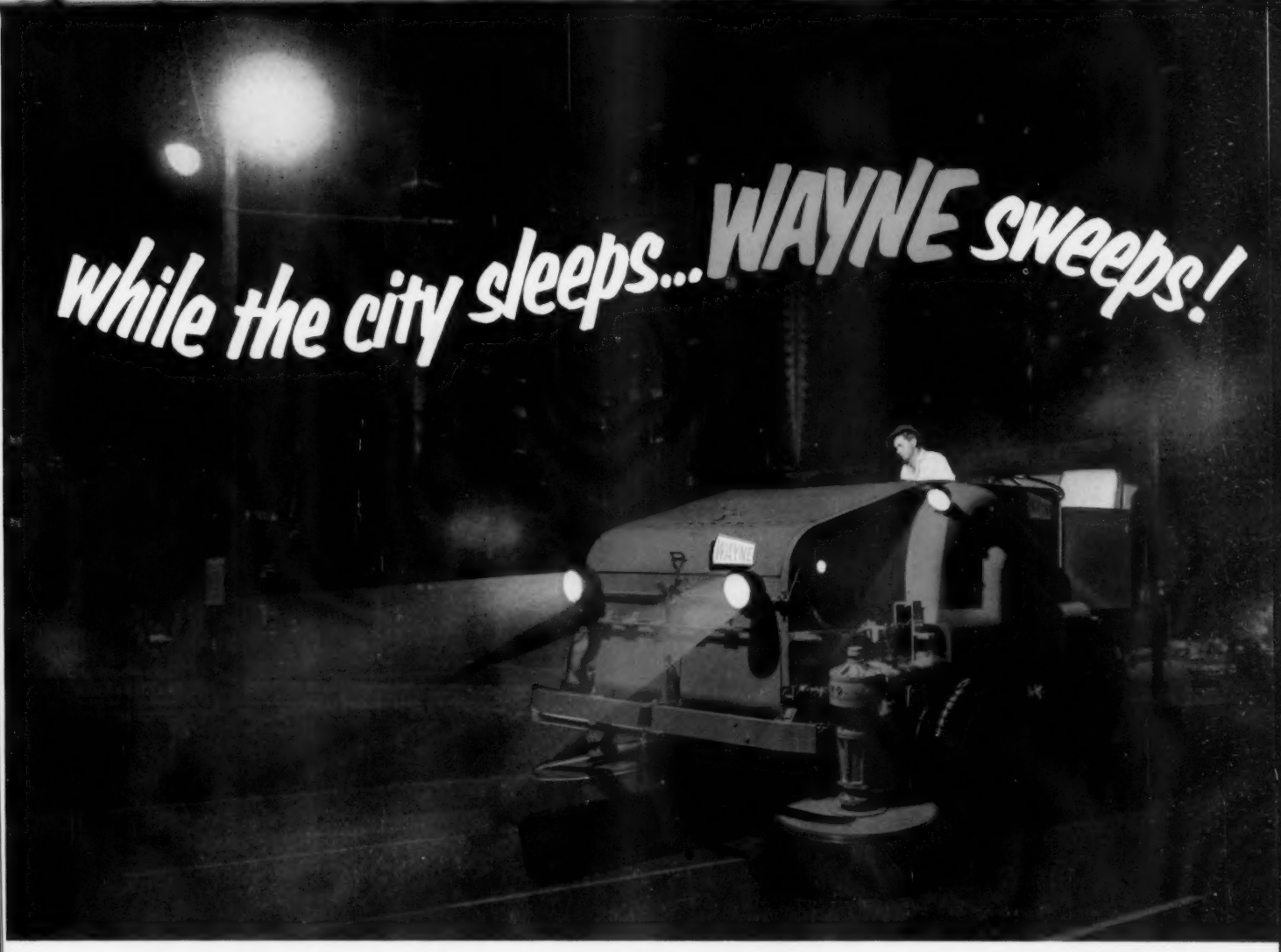
That's what we mean by a 3-star advantage. For detailed facts, send for Bulletin 5403.

DARLING VALVE & MANUFACTURING CO.

Williamsport 22, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.

Need more facts about advertised products? Mail your Readers' Service card now.



The Only Street Sweeper with Proved Performance...Speed...Maneuverability!

Night and day, around the clock on the streets of leading cities throughout America, Wayne Street Sweepers are proving their dependability, ruggedness and superior performance.

That's because every Wayne feature has been test-proved under the severest conditions of climate, terrain and daily use year after year.

Wayne pioneered and perfected the efficient features that today are the standard of the industry. That's why . . . when you purchase a Wayne Sweeper, you invest in the most dependable, economical, advanced street sweeper ever built.

Regardless of area, terrain or population, Wayne does the best sweeping job at lower cost. And that is a matter of record!

Write for descriptive literature.

Sold and serviced in all principal cities

WAYNE

WAYNE MANUFACTURING CO. • 1220 E. LEXINGTON ST., POMONA, CALIF.
472 HIGHWAY 1, NEWARK, N. J.

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General Electric Fluorescent Street Lighting

Designed for the Community of Distinction

Quite frankly, fluorescent street lighting is designed for the above-average community. For fluorescent is the signpost of progress and prosperity. It's a symbol of a town with pride—pride in its people—pride in its government—pride in its hospitality—pride in its capacity to cast aside the old and embrace the new.

This is street lighting that says to the world—here is a good place to live, to work, to play, to shop, to invest. Here is a city well-managed, clean, attractive—a Community of Distinction.

For those fortunate cities whose officials are alert to progress, General Electric offers its services to assure the finest fluorescent street lighting any city can install.

The full story of G-E fluorescent street lighting is told in a new bulletin, GEA-6094. You can get a copy from your nearest G-E Apparatus Sales Office, or by writing to Section 452–159, Outdoor Lighting Department, General Electric Company, 1400 Western Avenue, West Lynn 3, Mass.

"Out of Darkness," a new, dramatic film story of how one community met its street lighting problems, is now available for showings to civic groups, community service organizations, etc. This 16-mm, sound, black and white movie runs 26 minutes. Borrow a print of "Out of Darkness" from your nearest G-E Apparatus Sales Office.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Now's the time to mail this month's Readers' Service card.

CONTROL DUST....

Quickly, Effectively, Economically

with Gulf Sani-Soil-Set

GULF SANI-SOIL-SET is the practical answer to your dust annoyance problems. Here are a few of the many good reasons why it will pay you to investigate this efficient dust-control medium now:

HIGHLY EFFECTIVE—Gulf Sani-Soil-Set eliminates dust annoyance completely immediately after application. No long waiting periods are necessary before the ground is ready for use. The dust allaying effect is accomplished by the action of the compound in adhering to and weighing down dust particles.

LONG LASTING—Because of its extremely low volatility and insolubility in water, Gulf Sani-Soil-Set remains effective for long periods. One application per season or year is usually sufficient.

EASILY APPLIED—Gulf Sani-Soil-Set is free-flowing, easy and pleasant to use. It can be applied by hand-sprinkling or by sprinkling truck, and spreads quickly.

SAVES MAINTENANCE EXPENSE—Gulf Sani-Soil-Set minimizes dust annoyance and expense in near-by houses, stores, and laundries.

Write, wire or phone your nearest Gulf office today and ask for a demonstration of the advantages of this modern proven dust allayer. If you have not yet received a copy of the pamphlet which gives further information on this quality Gulf product, mail the coupon below. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh, Pennsylvania.

GULF

Gulf Oil Corporation · Gulf Refining Company
1822 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of your new pamphlet, "Gulf Sani-Soil-Set—the modern, proven agent for controlling dust"

Name.....

Title.....

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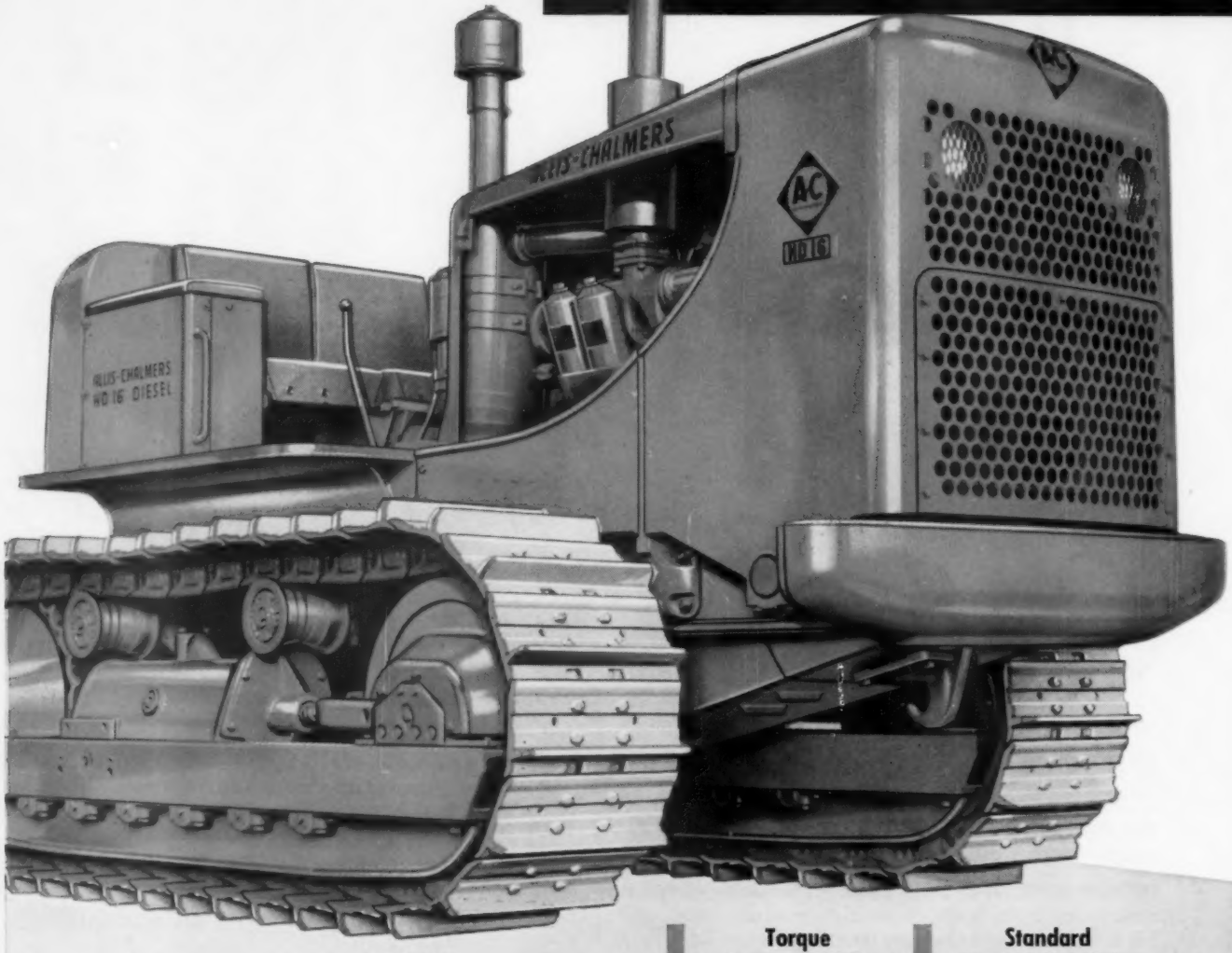
It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

Allis-Chalmers presents the NEW HD-16



Your choice of two outstanding drives

	Torque Converter Drive	Standard Transmission Drive
Horsepower	150 net engine hp	131 belt hp
Weight	31,600 lb	31,500 lb
Drawbar pull	up to 60,000 lb*	up to 35,945 lb*

*Limited, under normal tractive conditions to 90 percent of total weight of tractor and mounted equipment.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Get full details of this month's products . . . mail your Readers' Service card today.

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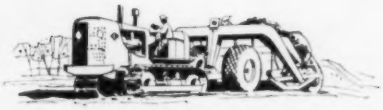
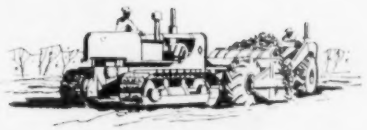
NEW STANDARDS OF PERFORMANCE

for a wide range of heavy-duty work

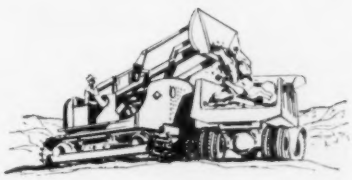


Set your sights on an HD-16! This big new tractor not only brings you *more* power for bigger jobs . . . it makes more effective use of horsepower, with a brand new Allis-Chalmers diesel engine and your choice of two new drives — the job-proved torque converter or the easy-shift standard transmission. Either way, the HD-16 brings you a new high in tractor-operator efficiency . . . a new high in work done under even the toughest conditions.

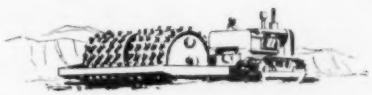


NEW STANDARDS OF DEPENDABILITY AND LONG LIFE

under *all* conditions!



The HD-16 follows the Allis-Chalmers *advanced basic design*, with such important features as its all-steel, Box-A main frame and one-piece steering clutch and final drive case . . . straddle-mounted final-drive gears with tapered roller bearings . . . unit construction . . . simplified lubrication and service designed with *better* maintenance in mind. What's more, it is newly engineered throughout to provide big safety factors in all components . . . plus outstanding new features like the new Allis-Chalmers heavy-duty diesel engine, new "wrap-around" radiator guard, husky new transmissions, new true-dimension track, and many others.



All in all, the new Allis-Chalmers HD-16 brings you an outstanding combination of performance and long life with both mounted and drawn equipment . . . a higher rate of production, more working time, more work done, LOWERED JOB COSTS. You OWE it to yourself to get all the facts now from your nearby Allis-Chalmers dealer.

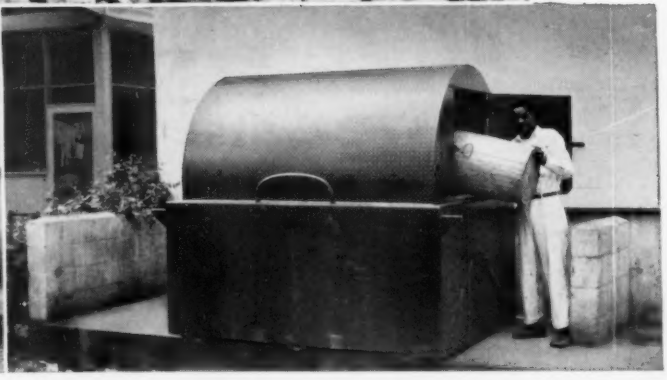
Need more facts about advertised products? Mail your Readers' Service card now.

Get full details of this month's products . . . mail your Readers' Service card today.

Here is the immediate solution refuse

The Dempster-Dumpster is operated by only one man, the driver, by means of hydraulic controls in cab. It picks up a loaded container, hauls to disposal area, empties (see photos here) and then returns it . . . serving one container after another.

This Lexington, Ky. groceryman had gone to the added expense of building a concrete platform to keep cans and crates full of garbage off the ground. He had done all he could within reason to make the best and most sanitary condition possible with conventional cans.



Yet, look at the difference after the 10 cu. yd. Apartment Type Container replaced all the inadequate cans, crates, barrels, etc.

Need more facts about advertised products? Mail your Readers' Service card now.

to the FOUR major bulk collection problems in any city!

1. UNSANITARY CONDITIONS: Health and Sanitation Departments are well aware of the disease spreading potential of unprotected rat and fly infested refuse.

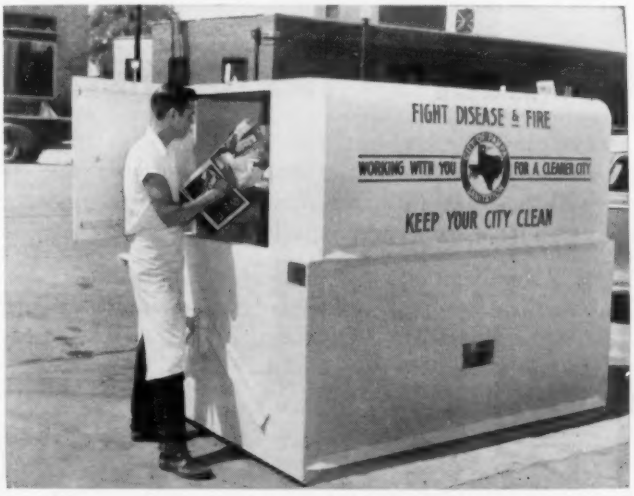
2. UNSIGHTLY CONDITIONS: Every citizen is conscious of the conditions caused by wind and scavengers scattering trash and refuse over alleys and streets.

3. FIRE HAZARDS: Fire Departments know too well the extent to which property is damaged and gutted by fires resulting from unprotected accumulations of trash, rubbish, inadequate trash cans, boxes, etc.

4. HANDLING COSTS: The cost of crews in the slow process of re-handling and loading trash and refuse is tremendous. Conventional trucks standing idle, waiting to be loaded, is a costly waste of equipment time.

All four of these bulk refuse collection problems can be quickly and completely solved by the Dempster-Dumpster System. Problems one, two and three are solved by the big steel Dempster-Dumpster Containers. These containers have self-latching doors and lids, keeping refuse out-of-sight between deposits by users. No rats or flies can contaminate the refuse. Winds and scavengers cannot scatter it. Fire hazards are eliminated. The fourth problem, rehandling costs, is solved by one truck-mounted Dempster-Dumpster and the driver serving numerous containers one after another.

Actual reductions in collection costs have ranged from 50 per cent up in cities where the Dempster-Dumpster has been installed. Without question, this system is recognized as the most sanitary and lowest cost method of bulk refuse collection ever devised. When, with this system, you can be assured of amazing cost reductions in service, with Sanitation, Citizen approval and Fire Prevention thrown in, it is worthy of investigation. Ask us to forward further information. Manufactured exclusively by Dempster Brothers, Inc.



The scene above was photographed in Pampa, Texas after the Dempster-Dumpster System was installed last year. One Dempster-Dumpster serves 33 detachable containers, ranging in capacity from 8 to 12 cu. yds. This equipment will be completely amortized by the city by savings in about four years.

The two photos at left show what happens when the Dempster-Dumpster Detachable Containers replace conventional cans in a typical housing area. Without the trash and garbage cans this area is an ideal place for children to play. Note that one 6 cu. yd. Apartment Type Container replaced some 14 conventional cans. Instead of a conventional truck with crew rehandling the refuse from cans to truck, a Dempster-Dumpster with only one man, the driver, will serve the loaded containers. There is no rehandling of refuse whatsoever.

THE DEMPSTER DUMPSTER SYSTEM

DEMPSTER BROTHERS
965 Dempster Bldg.
Knoxville 17, Tennessee

Use Northern Gravel for Rapid Sand Filter

The South District Filtration Plant of the city of Chicago, is the largest in the world. Northern Gravel Company furnished them 422 carloads with clocklike regularity, enabling installation continuously and economically

Filter Sand Specifications

are carefully laid out. The Effective Sizes and Uniformity Coefficients used by Consulting Engineers and also recommended by the American Water Works Association are the result of long years of research and experience.

The Northern Gravel Company is equipped to give you prompt shipment whether it be one bag or many carloads, exact to specifications. Filter sand can be furnished with any effective size between 0.35 MM and 1.20 MM.

Chemical Quality

of the filter sand is also important. It must be hard, not smooth, and free of soluble particles. This requires perfect washing and grading facilities. We have every modern device for washing, drying, screening and testing.

Filter Gravel

supporting the Filter Sand Bed, must be in turn, properly graded to sizes calculated to support the Filter Sand, and be relatively hard, round and resistant to solution.

Northern Gravel has no equal in facilities and our reserves of both sand and gravel are inexhaustible. Northern Gravel Company has been in business over 40 years. We guarantee uniformity of products and our records enable us to duplicate your requirements on short notice. Our location is central and we have commodity rates in every direction.

Northern Gravel Company

Muscatine, Iowa

Box 307 Ph.: Amherst 3-2711

LEADERS IN PUBLIC WORKS

★

Lewis W. Klockner, shown on the front cover of this issue, is Superintendent and Chief Engineer of the Trenton, N. J., Water Works. The wooden pipe is from a section of a line laid near the Trenton Battle Monument in December, 1801, and removed from the ground in 1930. "Lew" Klockner has held his present position since 1948; before that he was with Ralph B. Carter Co. for three years. He was in the Army for nearly five years, entering as a private and coming out of service as a Major; during the latter part of the war he served in the Mediterranean area. Before the war, he was a sanitary engineer with the New Jersey State Department of Health.

The Trenton Water Works serves not only the city of Trenton, but also neighboring townships, in all about 180,000 people. Trenton's pride and joy is the new 25-million gallon filter plant which draws water through an intake extending 200 ft. into the Delaware River. One of the first recommendations made after Lew took office was for the construction of this plant which was dedicated this past April. Water department personnel number 185; Mayor Donal J. Connolly is Director of the Department of Public Works of which the Water Works is a part; and Gus Traub is assistant superintendent. Present plans contemplate a complete rehabilitation and expansion of the water distribution facilities.

Mr. and Mrs. Klockner have one son, Lew Jr., now eight years old and attending Trenton's public schools.

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

MUELLER®

DEPENDABLE... in any main

Sizes ½" through 2"
Shipment from stock
Fully Warranted

Years of trouble-free service in mains of widely differing materials have proven the dependability and strength of Mueller Corporation Stops. A wide variety of inlet and outlet threads, a unique compression joint inlet, and other special inlets and outlets, are available to fit your needs — whatever they may be.

Designed for easy insertion under pressure, these stops are made entirely from the finest Water Works Bronze. All keys are precision machined and individually ground and lapped into the stop body. Each stop is carefully inspected and pressure tested. Exposed threads are coated with plastic to prevent shipping damage.

Consult your Mueller Representative, your W-96 Catalog or write direct for full specifications.

MUELLER CO. DECATUR, ILL.

Dependable since 1857

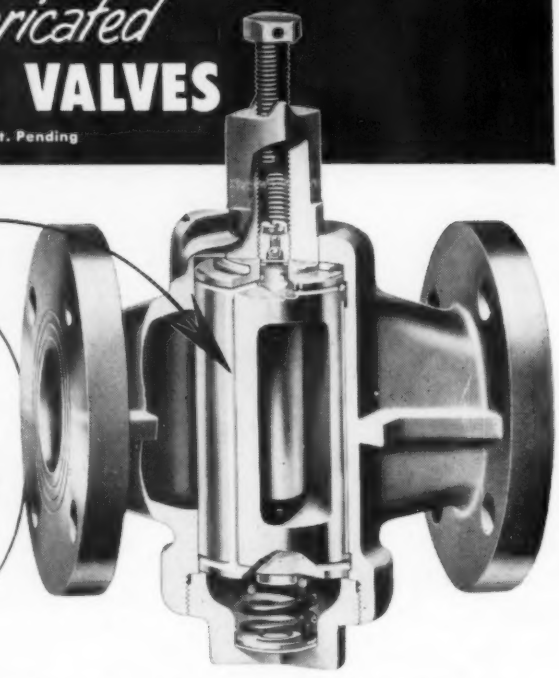
FACTORIES & OFFICES AT DECATUR · CHATTANOOGA · LOS ANGELES · SARNIA, ONTARIO

Get full details of this month's products . . . mail your Readers' Service card today.

No. 2* of . . .

12 REASONS WHY
YOU SHOULD BUY AND USE
LOW-PRICED

HOMESTEAD
Lubricated
PLUG VALVES
Pat. Pending



HOMESTEAD'S EXCLUSIVE, COMPLETELY CONTROLLED HIGH-PRESSURE LUBRICANT SYSTEM

. . . forces chemical seal over all seating surfaces; prevents any possibility of sticking by momentary piston-like action of plug which is moved downward and returned instantly against packing ring. Provides 100% seal around ports; guarantees a completely filled system.

This is only **ONE REASON WHY** you should buy and use, *low priced* **HOMESTEAD LUBRICATED PLUG VALVES.**

HERE ARE ALL TWELVE

1. Reinforced Teflon packing ring.
2. Completely controlled high-pressure lubricant system.
3. 100% pipe area and venturi patterns.
4. No spring torsional stress.
5. No mechanical adjustments.
6. Two lubricants handle most services.
7. Extremely close tolerance between sealing surfaces.
8. Triple head-seal with Lubricant and Teflon packing ring.
9. Plug floated on Teflon surfaces.
10. Leak-proof, double-ball-and-lubricant-sealed check valve.
11. Full-threaded screw assures clean lubricant.
12. Extruded lubricant shows a full protecting system.

FOR CATALOG AND COMPLETE DETAILS MAIL COUPON TODAY

Without obligation, send Reference Book 39—Section 5 on HOMESTEAD LUBRICATED PLUG VALVES.

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____

HOMESTEAD VALVE MANUFACTURING COMPANY
Serving Since 1892
P. O. BOX 40 CORAOPOLIS, PA.

Need more facts about advertised products? Mail your Readers' Service card now.

NO MATTER HOW THIN . . .

Thank you for your permission to use material appearing in Public Works in any way that will be of benefit to engineers. The December editorial "No Matter How Thin You Slice it. . " was duplicated and handed out at a recent meeting of engineers here; and we will probably reproduce it in the May issue of our Oregon Section Newsletter. Because of your interest in the matter I am sending you a copy of a report by a Committee of engineers which has made a study of conditions of practice in this area. At our December meeting we had planned discussion of two topics, "Employee Compensation" and "Bidding for Engineering Services." There was so much interest in the first subject that, by common consent, the second topic was not discussed.

Gordon L. Burt,
President, Oregon Section, American Soc. of Civil Engrs.

FILE SYSTEM NEEDED FOR CITY ENGINEERS

I am setting up a new filing system for the City Engineer's office. Can you give me references on filing systems similar to the one used by AIA, but intended for municipal, consulting or civil engineers?

Joe E. Jenkins
City Engineer
Orange, Texas

Editor's Note: Perhaps some of our readers will forward outlines of their filing systems to Mr. Jenkins. We will be glad to have copies of these suggestions.

BOOKS IN BRIEF

STANDARD METHODS TENTH EDITION

This edition carries the largest amount of new material since the original issue. The organization has

SURGEABILITY...

THE LATEST WORD IN WATER TREATMENT

Surgeability is defined as stability of performance under rapidly changing and unpredictable conditions including flow. This characteristic is vitally important in clarification and cold process softening installations. Surgeability is designed and built into the Graver Reactivator®.

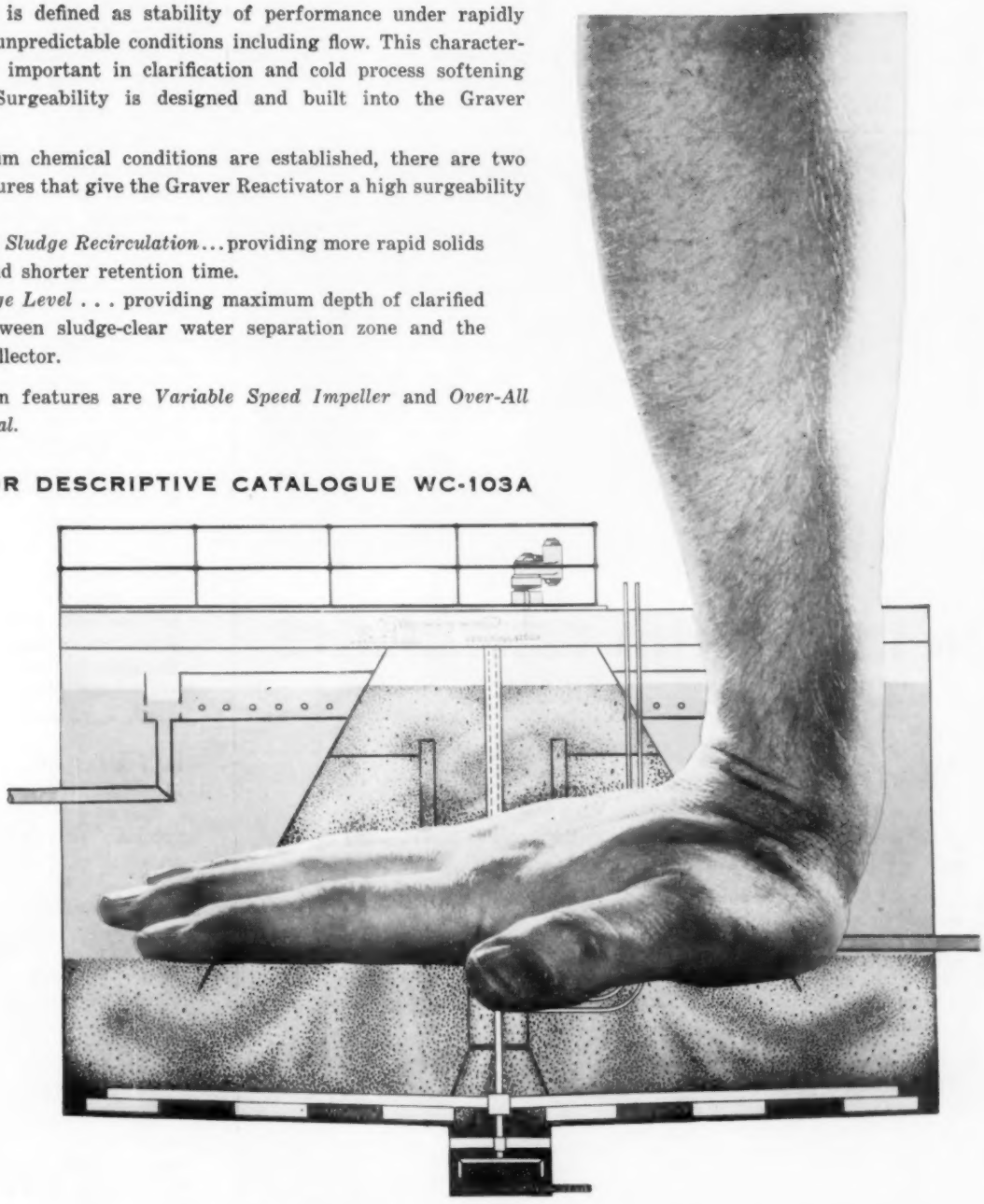
Once optimum chemical conditions are established, there are two important features that give the Graver Reactivator a high surgeability factor:

Controlled Sludge Recirculation... providing more rapid solids contact and shorter retention time.

Low Sludge Level . . . providing maximum depth of clarified water between sludge-clear water separation zone and the effluent collector.

Other design features are *Variable Speed Impeller* and *Over-All Sludge Removal.*

WRITE FOR DESCRIPTIVE CATALOGUE WC-103A



Department NK

GRAVER

GRAVER WATER CONDITIONING CO.

A Division of Graver Tank & Mfg. Co., Inc.

216 West 14th Street, New York 11, N. Y.

Thousands use our Readers' Service card to keep up to date . . . do you?

been changed to provide greater ease in locating a desired method or discussion. Typography has been improved to give easier use. The volume is now divided into six parts as follows:

Part I—Physical and chemical examination of water. New material includes sections on correctness of analysis and on statistics. Additions include discussions of apparatus and technics; nomographs for alkalinity and CO_2; the amperometric titration and Palin methods for chlorine; the Megregian-Maier and Lamar methods for fluorine; the complexiметric EDTA titration method for hardness; and the flame photometric methods for potassium and sodium.

Part II—Physical and chemical examination of sewage. Sections on precision and accuracy and a discussion of methods evaluation have been added; also the potentiometric titration method for acidity; amperometric titration method for chlorine; and three additional methods for dissolved oxygen.

Part III—Physical and chemical examination of industrial wastes. The cyanide method is practically a new one; an amperometric titration method for chlorine, spectrophotometric and photometric methods for color, colorimetric methods for heavy metals, and the aminoantipyrine methods for phenol are also new.

Part IV—Physical and chemical examination of sludge and bottom sediment, a complete reorganization of the Ninth Edition and a new approach to the analysis of these materials.

Part V—Bacteriologic examinations of water. The membrane filter technic has been added as a tentative procedure. Requirements for glassware and equipment and for the standard plate count have been modified; a new section on nuisance organisms has been added and an additional MPN table included.

Part VI—Biologic examination of water, sewage and sludge. More explicit directions for collecting and examining samples are given and 12 pages of illustrations or organisms are included.

American Public Health Association, Inc., 1790 Broadway, New York 19, N. Y.; 522 pp. $7.50.

REPORT OF WATER WORKS

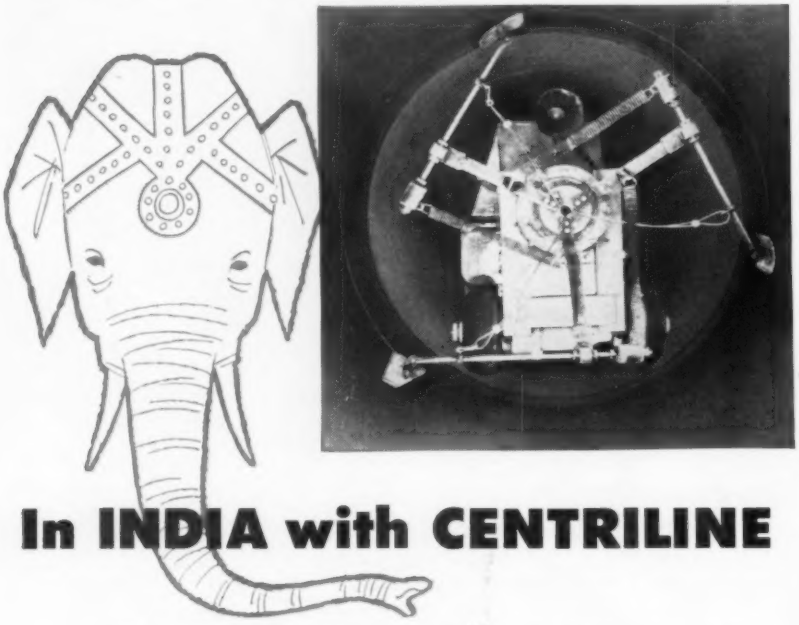
This attractive report covers the Administration of the Water Works Department of the City of Bombay for the year 1953-54, and includes maps and tables. 21 pages. J. D. Daroga, Hydraulic Engineer, Improvement Trust Bldg., 7 Napier Road, Fort, Bombay 1, India.

MATERIALS OF CONSTRUCTION

This new Sixth Edition of a book published first in 1915 contains much material of value to the engineer. There are nine principal sections: Metals; building stones and mineral aggregates; cementing materials; concrete; brick and clay products; timber; organic plastics; laminates and adhesives; and organic protective coatings. The data on all of these have been brought completely up to date. The text is by Mills, Hayward and Rader. Mr. Rader, author of this edition, is now Professor of Civil Engineering at Wisconsin. John Wiley & Sons, Inc., New York; 622 pages; illustrated; $7.50.

MUNICIPAL GOLF COURSE

Organizing and Operating Guide published and distributed by the National Golf Foundation, 407 South Dearborn Street, Chicago 5, Illinois; 128 pages, illustrated; $3, postpaid.



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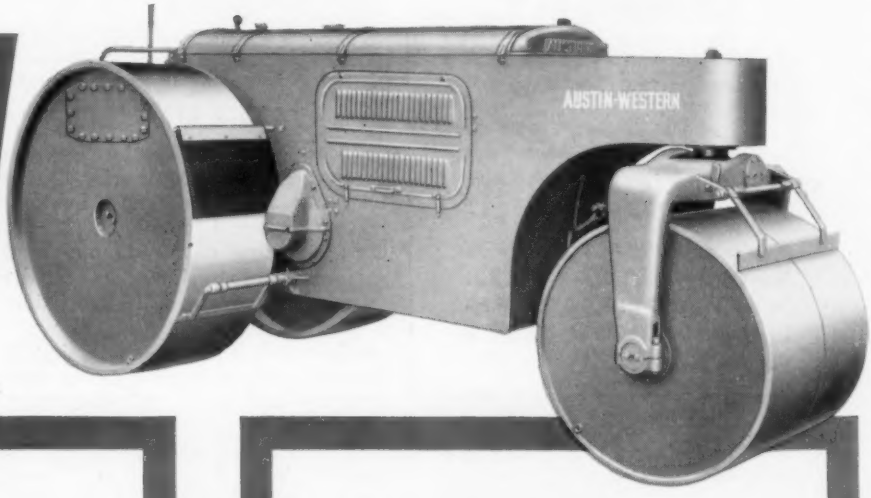

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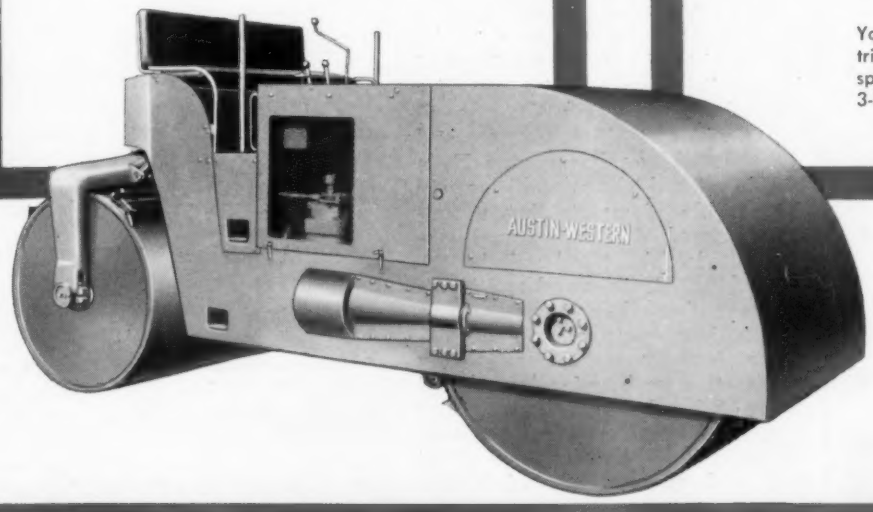

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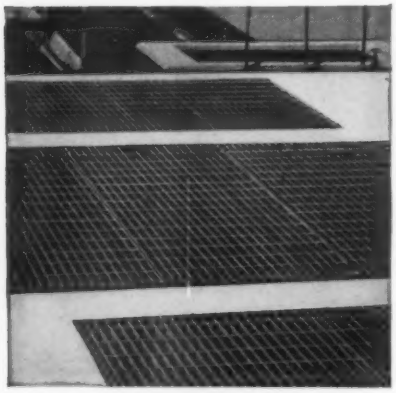

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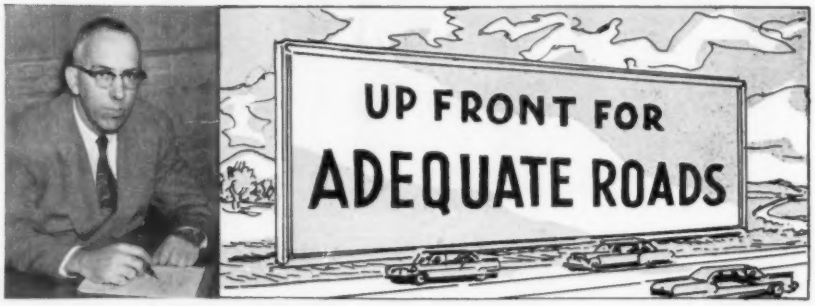

by LEO J. RITTER, JR.

Labor Time—The Special Committee on Highway Equipment of the Highway Research Board has released a report dealing with the hand patching of bituminous road surfaces. Studies show that, on the average, 28 percent of the crew time is used in performing actual work on the patch, with the remaining 72 percent being accounted for in preparatory and incidental operations, waits, and delays. Over 1000 man-hours of crew time were studied, including both hot and cold mix patches and spot sealing. The following are typical accomplishments observed for a four-man crew during an 8-hour work day: Placing cold mix patch, pavement removed by hand, 22 patches totaling 46 square yards.

Placing cold mix patch, tacked, no old pavement removed, not rolled, 244 patches totaling 400 square yards; rolled, 137 patches totaling 255 square yards.

Spot sealing 80 patches totaling 1025 square yards.

Future Highway Vehicles—A recent article by C. A. Lindholm in the SAE Journal points toward advances which are expected to take place in the next 25 years in the design of trucks and buses. Some of his predictions are of interest. For example, he predicts that transit buses will seat 100 passengers and be operated by only one man. Even the heaviest highway vehicles will be capable of maintaining a sustained speed of 15 mph on a 6 percent grade. The trend will be toward bigger trailers and multi-unit trains rather than toward single trucks. For example, on long-distance (expressway) operations, a two-trailer combination is expected to be 85 feet long and have a gross weight of 110,000 pounds. A three-trailer unit will have a length of 125 feet and gross weight of 160,000 pounds.

Manual—The American Concrete Institute has published a new edition of the "ACI Manual of Concrete Inspection". The manual is 232 pages in length and covers inspection in all phases of concrete work, including the making of good concrete and its effective use. Available from the ACI, 18263 West McNichols Road, Detroit 19, Michigan.

Aviation—We know this is supposed to be a highway and street column, but other forms of transportation keep intruding. For instance, developments in aviation and airports are of absorbing interest. Did you know that Chicago's Midway Airport is the busiest in the country?—There is an aircraft arrival or departure at Midway every 1½ minutes, on the average, day in and day out. The Department of Commerce will explore the interest of nearby state and local officials in planning and financing an additional airport for Washington in the near future. About one million people are now employed in aviation in this country. Principal problems of airport planners include a lack of sufficient "air space" in the big metropolitan areas and on the airways connecting them, and noise. Helicopter (and other rotorcraft) are forcing sharp changes in the planning of aviation facilities. Current thinking is directed toward tapping a travel market of 133 million passengers who make air trips of 150 to 170 miles. In 10 years, the CAA estimates that there will be 286 daily helicopter movements between Washington and New York alone, carrying nearly 1,500,000 passengers a year. The CAA has already certified 11 helicopter types and is working with industry on certification of new and larger models. The CAA is seeking an increase of $23 million per year for the federal airways program.

Looking Ahead — The Bureau of Public Roads has submitted a report to the Congress, as requested some time ago and as mentioned in earlier columns, estimating the cost of a completely adequate highway program for the country for the next 30 years at 297.1 billion dollars. Wonder where the 0.1 billion came from? The estimate averages about $10 billion per year. This includes the cost of maintenance (23%), the

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Prevent costly infiltration. Stop pumping and treating thousands of gallons of ground water. Amvit Jointed Clay Pipe is infiltration proof and root proof.

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Testing Amvit Jointed Clay Pipe are from, (L. to R.) E. T. Davis, Partner, The Chester Engineers; Joseph Diulus, President, Diulus Construction Company, Inc.; C. K. Strob, Partner, The Chester Engineers; and Tracy Price, American Vitrified Products Company.

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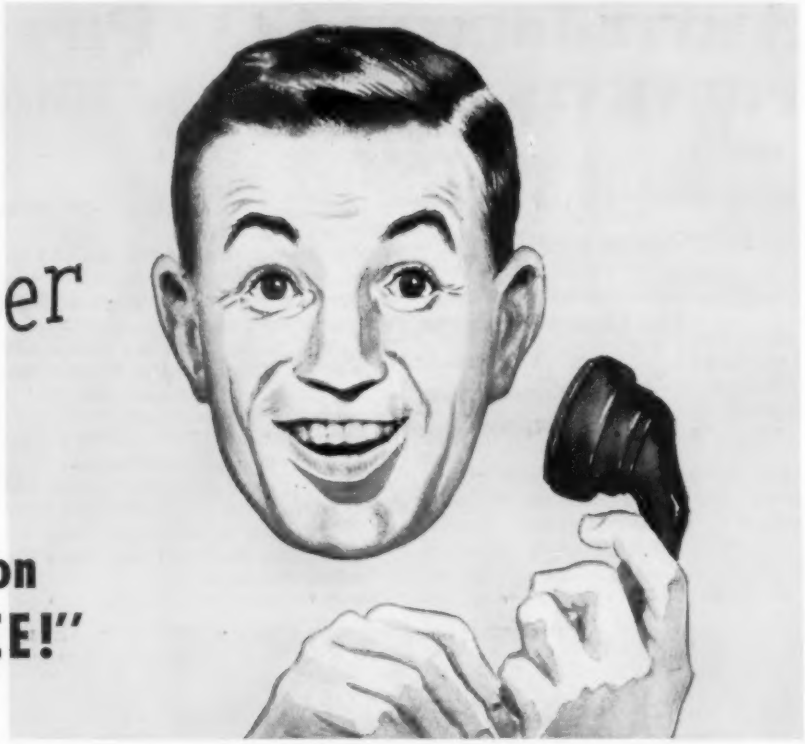

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cost of administration (5%) and that of construction (72%). This rate of expenditure is in contrast to an estimated total expenditure in 1954 of $6.1 billion.

One of the paragraphs in the report was of interest to us and is quoted, as folllows. "Should the cost be distributed among all vehicles, over the life of the roads, the additional cost per mile of travel would be very small, amounting to about one-quarter of a cent per vehicle mile. About three-fourths of a cent per vehicle mile is now being collected in the form of road-user taxes. These amounts may be compared to the cost of owning and operating a vehicle, which for passenger cars is variously estimated at from 8 to 10 cents per mile, and for trucks at correspondingly higher figures. The cost of the highway itself is but a small part of the total cost of motor-vehicle transportation."

For a long time we've felt that the one-quarter cent per vehicle mile is what we in the highway business should be selling, rather than the big, multi-million dollar programs which tend to frighten senators, congressmen, and public alike.

New Luminaire—The Traffic Department of the Division of Highways in California has come up with a new 8-foot, fluorescent luminaire, several of which have been placed in service in Humboldt County. The fixture itself is not enclosed, but is backed by a combination of reflectors of various shapes. The units have proved to be very effective in lighting wet pavements. They are completely described in an article by G. M. Webb and R. W. Mathews in the March-April issue of *California Highways and Public Works.*

Who and Where—H. S. Fairbank, deputy commissioner of the Bureau of Public Roads, retires soon; his place will be taken by Ted Holmes, longtime head of the Bureau's Highway Transportation Division. New director of the Yale Bureau of Highway Traffic is Frederick Hurd. In Evanston, Frank Kreml has been named director of Northwestern's new Transportation Center. New honorary members of the American Concrete Institute are Thomas E. Stanton, former materials and research engineer of the California Division of Highways, and Frank H. Jackson, engineering consultant of Washington, D. C. George C. Koss of Des Moines, Iowa has been installed as the new president of the Associated General Contractors of America (AGC). A new recruitment program for young engineers has been announced by Dwight Palmer, Commissioner of the New Jersey State Highway Department. Governor A. A. Ribicoff has called for a complete reorganization of the Connecticut State Highway Department. Russell McCain, chairman of the Maryland State Roads Commission, has been elected president of AHONAS.

Miscellany—An expanded secondary road program, involving an expenditure of about 1¾ million dollars, will be inaugurated in Rhode Island July 1. Surprisingly enough, both automobile production and sales were up sharply during the first quarter of this year. The third Annual National Highway Conference for county engineers and officials, sponsored by ARBA, will be held in Gatlinburg, Tennessee on September 12-14. An army report, recently made public, concludes that the field use of chrome-lignin stabilized soil briquets for military purposes is impractical, largely because of inadequate field mixing techniques. The next meeting of the Highway Research Board will be held January 16-20, 1956. North

Although Grote tries to avoid superlatives, actual road and laboratory tests prove . . .

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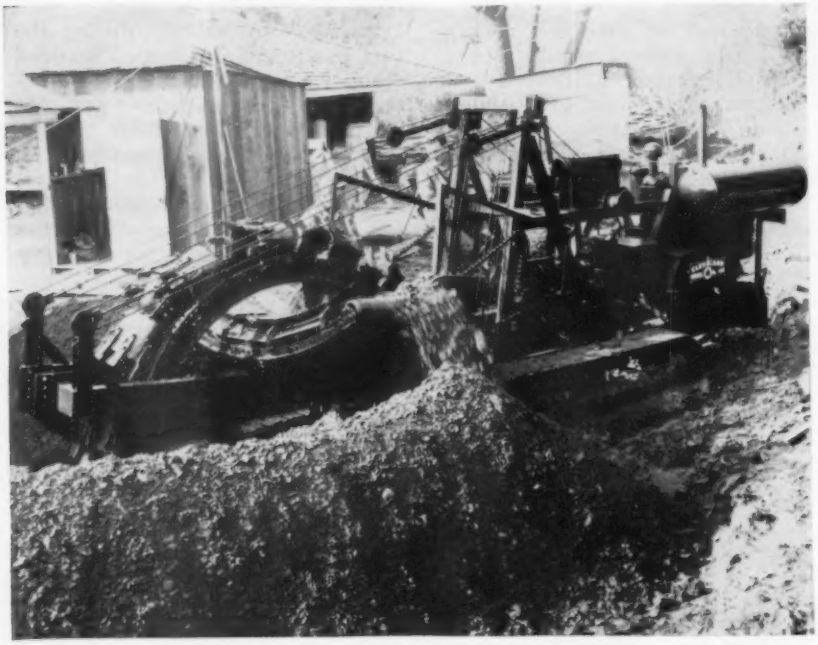
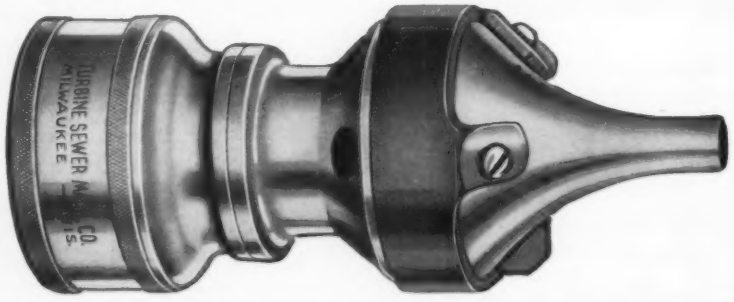


STORM DRAIN TRENCH, 5½ feet deep by 22 inches wide, at El Rancho Verdi, Hayward, Calif. was dug by this Cleveland in a right-of-way so narrow it allowed barely enough room to unload the trencher. The outstanding maneuverability of the compact Cleveland trencher was a most important factor on this job, according to owner L. C. Jensen of Castro Valley, Calif. To dig *more trench . . . in more places . . . at less cost* get the facts on Cleveland trenchers from your local distributor or write: THE CLEVELAND TRENCHER CO., 20100 St. Clair Ave., Cleveland 17, Ohio.



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Dakota has raised its fuel taxes from five to six cents per gallon, with the proceeds to go to secondary roads. Montana also increased its taxes (from six to seven cents per gallon) for a two-year period, beginning last April 1. A unique "traveling award" has been made available to a selected student in highway engineering at the University of Illinois; funds provided by a contractor will permit the student to visit state highway departments and highway construction projects over the country during a 3-month period. A 45.7-mile monorail system has been proposed for Los Angeles to cut commuting time.

• • •

Positions Open for Civil and Sanitary Engineers

The New York District, Corps of Engineers, 111 East 16th St., New York 3, N. Y., needs civil engineers in GS-7 and GS-9 categories, $4580 to $5060 per year; also hydraulic engineers, structural engineers and engineering aids. These positions are for work in New York City, in up-state New York and in New Jersey. Write or telephone A. J. Rizzo, Chief, Personnel Branch, at above address.

The Veterans Administration, Washington 25, D. C., needs civil engineers in GS-9 and GS-11 grades, the latter paying $5940 per year.

New York State is seeking engineers with experience in sanitary and public health engineering. The rating is Junior Sanitary Engineer; the pay ranges from $4350 to $5460. Apply to State Dept. of Civil Service, 270 Broadway, New York 7, N. Y.

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Well Qualified Engineer is Available

Graduate of Iowa State in 1924, with wide experience in water and sewer design; in construction; and in sales and sales management is available. An officer, during World War II, served with Army and Air Force in this country and overseas, and on Alcan Highway. Management experience since the war. Desires a position as manager or superintendent of water or sewerage facilities, commissioner of public works, city manager or similar. Address Box 6B, Public Works Magazine, which will forward all inquiries.

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Yes, we at Rockwell are prepared for a period of growth and expansion unparalleled in the history of water distribution. We invite you to make the best use of our equipment and facilities in the days and years ahead.

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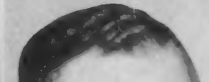
ON THE NEXT PAGE . . . Courtney Shenkle, Factory Manager, tells you about the new Rockwell water meter plant at Uniontown, Pa.

New Rockwell Water Meter

COURTNEY SHENKLE, *Factory Manager, Uniontown, Pa.* **says:**
"I'm proud of this plant, its people, and, most important, the high degree of precision we are building into Rockwell water meters."



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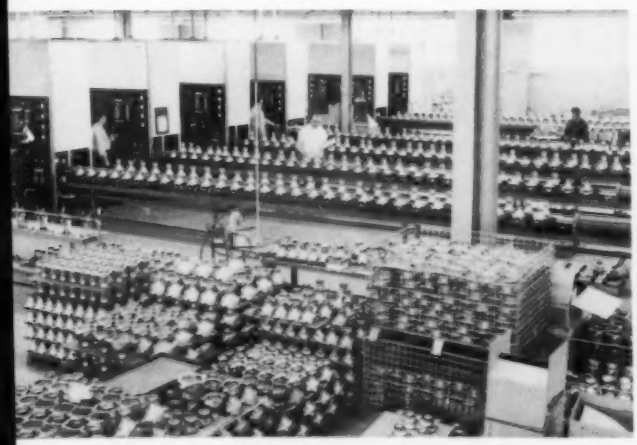
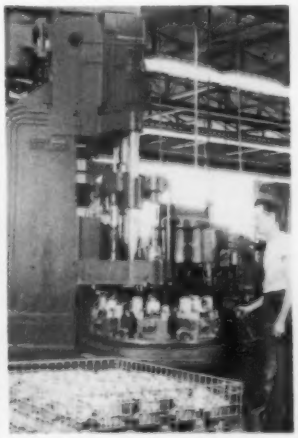
Our huge investment in this new plant and equipment is solid evidence of our faith in the future and growth of the water utilities. It is a confidence you can share in your plans for the improvement and expansion of your own operations.

For light machining, Rockwell-built Delta drill presses provide flexibility and accuracy.

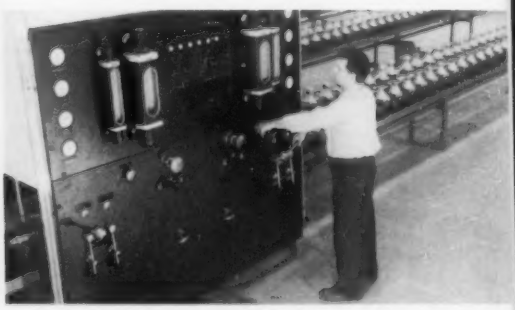
Previously sub-assembled parts are fitted into meter cases at this station.



Multiple test stands, especially developed by Rockwell engineers for proving accuracy before shipment.



This huge automatic machine performs seven different operations on a meter case.



Operator at test stand panel controls rate of flow and water pressure. Meters can be tested at three times the pressure normally encountered.

ON THE NEXT PAGE . . . C. K. Madison tells you about the Rockwell research and development program.

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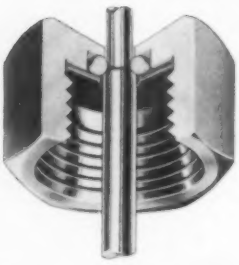
STUFFING BOX NUT
ASSEMBLY



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In the Rockwell organization, research and development is budgeted at a substantial figure in our tabulation of operating expense. Planning ahead, searching for better meter designs and improved meter components is a never-ending process. From this program, which involves both our own laboratories and Research Fellowships, have come many significant developments that either enhance water meter performance or add to the value customers receive from our products. It's a carefully conceived program designed to improve the economic future of water distribution and to increase our usefulness to the water works industry.

C. K. MADISON, *Vice President, says:*
"In my 30 years' experience with water meters, I consider our new O-Ring stuffing box assembly the greatest single improvement ever developed."

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Rockwell Empire Type 12 Meter

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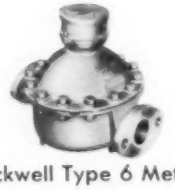

Rockwell Type 6 Meter

Rockwell Empire Type 16
Meter

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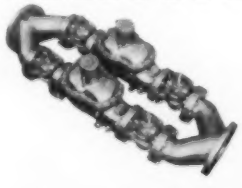
Rockwell-Nordstrom
Standard Valve

Rockwell-Nordstrom Gear
Operated Valve



Rockwell Manifold
Compound Meter Unit

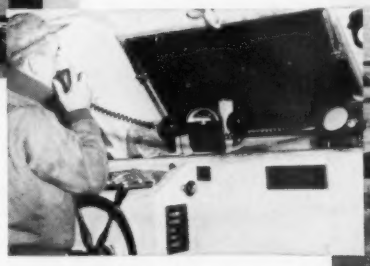
ROCKWELL MANUFACTURING COMPANY
PITTSBURGH 8, PENNSYLVANIA

Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles Midland, Texas
New York Kansas City, Mo. Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa

Motorola 2-way radio

VITAL TOOL IN MACKINAC BRIDGE CONSTRUCTION

Supervisors have constant contact with all operations.



Boats are radioed orders from shore, saving travel time.

HERE'S HOW 2-WAY RADIO SPEEDS THE WORK

Tying in all the working forces building the giant 5-mile bridge across the Straits of Mackinac was a big task, but 38 Motorola 2-way radio units did the job successfully.

Floating derricks, job tugs, personnel boats, trucks, autos and land based stations—all are a few seconds away from each other with radio. Supervisors do a full-time job, transmitting new orders immediately and receiving important messages—in the auto, office, or on the water.

Adverse weather, wind and current reports are flashed instantly to off-shore crews . . . these same crews can radio and get quick help if injuries occur. In these, and a dozen other ways, Motorola radio is enabling the impossible — faster and at less cost.

HERE'S WHY *ONLY* MOTOROLA COULD DO IT SO WELL

VERSATILE: Motorola produces the greatest variety of 2-way radio equipment available . . . portable, mobile and base station equipment were combined for the Mackinac Project to form a custom-made system at production line prices.

RUGGED: Motorola equipment is built to take the severe beating that any construction work imposes on it . . . to deliver when needed most. Motorola radio has been proven in use to *outlive* any other.

EXCLUSIVE FEATURES: The pioneer and leader, Motorola, offers more *exclusive* advantages and features than any other 2-way radio found anywhere.

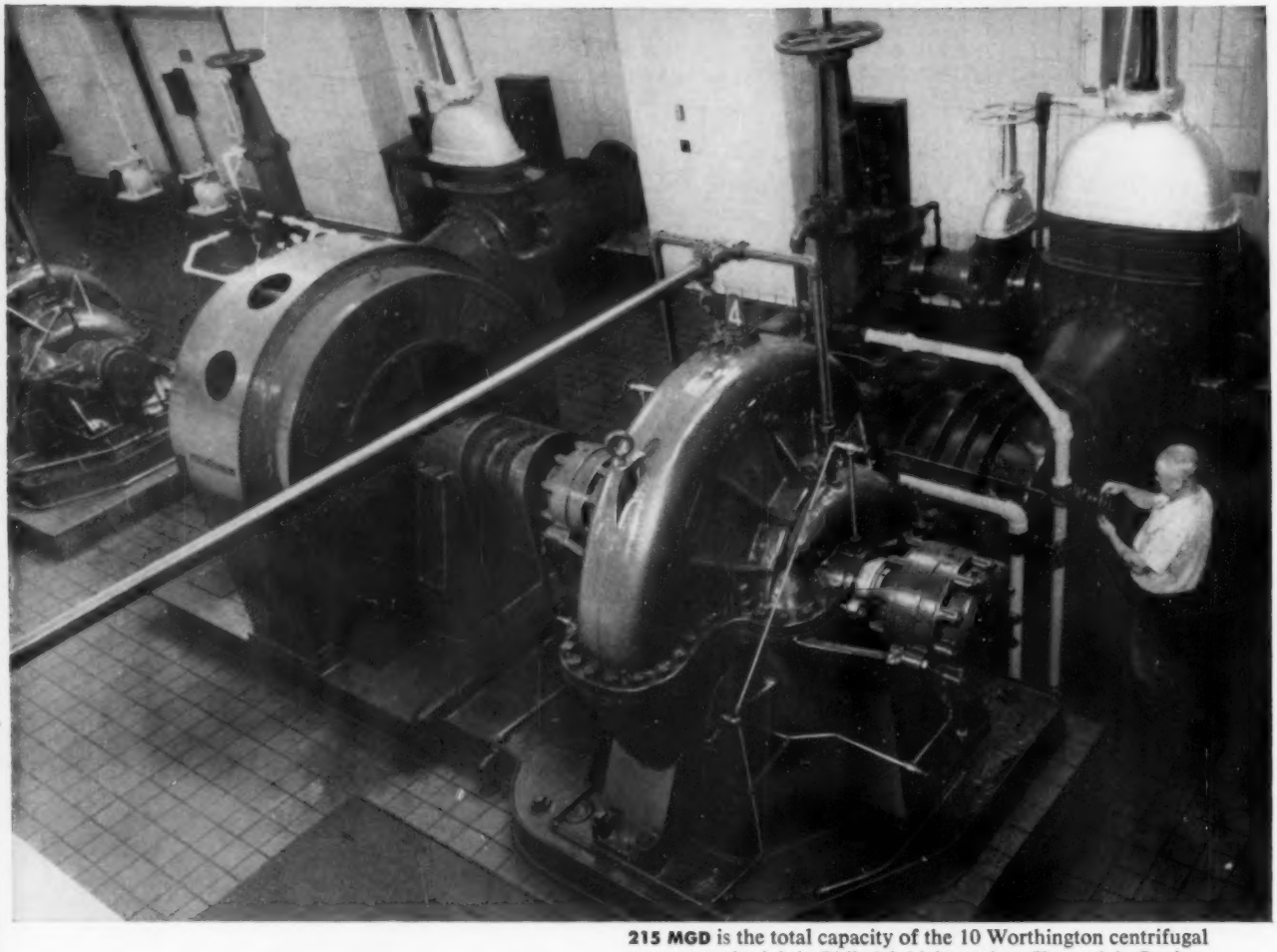
SERVICE: A Motorola Service Station a few miles from the Mackinac Project stands ready for prompt, efficient maintenance. Motorola offers the most complete national service set-up—650 Authorized Service Stations, strategically located and on call 24 hours a day . . . assuring the fastest, most dependable service available.

Motorola
2-WAY RADIO

Motorola Communications & Electronics, Inc.
A SUBSIDIARY OF MOTOROLA, INC.
4501 AUGUSTA BOULEVARD CHICAGO 51, ILLINOIS
ROGERS MAJESTIC ELECTRONICS LTD. TORONTO, CANADA

Motorola consistently supplies more mobile radio than all others combined—
proof of acceptance, experience and quality.
The only COMPLETE radio communications service—
specialized engineering . . . product . . . customer service . . . parts . . . installation . . . maintenance . . . finance.
"The best costs you less—specify Motorola".

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.



215 MGD is the total capacity of the 10 Worthington centrifugal pumps on the job in Philadelphia's modern Torresdale Station.

Philadelphia's newest pumping station has 10 Worthington centrifugals

Back in 1800 Philadelphians got along on 700,000 gallons of water a day.

It was pumped through 35 miles of wooden pipes from America's first municipally owned pumping station, located where City Hall now stands.

Today the city's water system has reached the point where just one of its 16 pumping stations — the modern Torresdale Station — can pump 215 million gallons of water a day into the 70-square-mile area it serves. That gallonage is the capacity of Torresdale's 10 electric-motor-driven Worthington centrifugal pumps which range in horsepower from 250 to 1750.

This is one more example of the tough assignments handed to Worthington water works equipment these days by municipalities on all sides. Whether the need is for pumps, comminutors, Diesels or turbines, there's a Worthington unit with design and construction features tested on a thousand jobs. There's more to be said, of course, and it's all in Bulletin WP-1099-B60. Write for it to Worthington Corporation, Public Works Division, Harrison, New Jersey, or get in touch with your nearest Worthington district office. W.4.2

SEE the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street.

WORTHINGTON

ALL MAJOR PUBLIC WORKS EQUIPMENT UNDER ONE RESPONSIBILITY

Water Works Pumps • Sewage Pumps • Comminutors • Vertical Turbine Pumps • Vacuum Pumps

Get full details of this month's products . . . mail your Readers' Service card today.

Road and park maintenance. Pushing a grader or dozer blade, the Universal 'Jeep', with its 4-wheel-drive and special low gear range, does everything from maintaining roads and driveways to snow removal.

Warehouse work. Hydraulic fork lift loader makes the Universal 'Jeep' ideal for materials handling. It picks up and carries a 1-ton load on rough, uneven ground as well as on warehouse floors. And regardless of terrain, the load remains level.

Mobile power. With power take-off, the 'Jeep' can be used to operate air compressors for pneumatic tools, as shown, electric power generators and other belt-driven equipment. It saves the cost of an auxiliary engine and the time lost loading or towing it.

Spraying. This 4-wheel-drive 'Jeep' Truck with sprayer, goes into roughest terrain, for weed or mosquito control work in wooded areas, parks or outdoor theaters. Other spraying equipment is available for every spraying need.

Mowing. No matter how hilly your golf courses or parks, the 'Jeep' with gang mower cuts grass or weeds with greater safety, and its pneumatic tires don't mar the turf. A rear-mounted blade mows shoulders of roads and drives.

Transporting workers. The 4-wheel-drive 'Jeep' Station Wagon gets through sand, snow, mud and ice where ordinary vehicles fail. It carries 6 or more workers with plenty of room for tools. On good roads it can be quickly shifted into 2-wheel drive.

Tough jobs like yours demand 4-wheel drive!

These are only a few examples of the many jobs 4-wheel drive 'Jeep' vehicles can do... especially when equipped with special attachments for specific jobs.

'Jeep' family vehicles save you money with low upkeep, long life and high resale value. They save manpower, time and effort by getting through to the job in all weather and road conditions and getting the job done.

It will pay you to learn more about the 'Jeep' family of 4-wheel drive vehicles. See your 'Jeep' dealer or write Willys Motors, Inc., Toledo 1, Ohio.

How does 4-wheel drive work? 4-wheel drive vehicles offer selective 2 or 4-wheel operation. In 4-wheel drive, the engine power is transmitted to all four wheels at once, rather than to the rear wheels alone, thus, utilizing the entire weight of the vehicle for maximum traction. A special low-gear range provides extra pulling power, when needed.

The **'Jeep'**® *family of 4-wheel-drive vehicles* | ***WILLYS... makers of the world's most useful vehicles***

Need more facts about advertised products? Mail your Readers' Service card now.

FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the coupon, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

Elevated Tanks and Other Storage Facilities

32. How engineers' designs and standard AWWA specifications are followed for fabrication and erection of water storage facilities are described in color illustrated booklet. Address the Darby Corp., Kansas City, Kans., or use the handy coupon.

Mechanical Joint Principle Applied to Sewer Pipe

101. The Amvit joint forms a tight compression seal between bell and spigot rings, prevents infiltration and stops root intrusion. Get data on Amvit jointed vitrified clay pipe from American Vitrified Products Co., Cleveland, Ohio.

The Millipore Filter—A New Tool for Water Works Labs

63. Bacteriological examinations of water and sewage are greatly facilitated by use of the Millipore filter which retains all microorganisms during filtration and provides an improved method for culturing. Full data on this method, with color illustrations of typical colonies are presented in a booklet by Millipore Filter Corp., 36 Pleasant St., Watertown 72, Mass.

Engineering Data on Micro-straining for Clarification of Water Supplies

64. Micro-straining by use of specially woven metallic fabrics clarifies liquids by removal of microscopic-sized suspended solids. A complete discussion of this process and its applications is covered in a 24-page "Micro-Straining Plant" booklet of Glenfield & Kennedy, Inc., 677 Fifth Ave., New York 22, N. Y. Check the coupon for your copy.

New Development in Refuse Collection

119. The newly introduced "Dempster-Dumpmaster" system for refuse collection combines the advantages of detachable containers for bulk collection, convenient front-end loading and compaction in a sealed body. Be sure to investigate the application of this system to your collection needs. Complete data offered by Dempster Bros., Knoxville 17, Tenn. Check the coupon today.

Pocket-Size Leak Detector

24. Latest literature describing this convenient instrument includes many helpful hints for operators. For your copy write Precision Electronics, Inc., 9101 King St., Franklin Park, Ill., or check the coupon.

How to Select Prestressed Concrete Bridge Members

26. Colorful folder, well illustrated, shows manufacture of "Amdek" prestressed bridge members and provides selection tables covering several AASHO loadings. Full data from Concrete Products Div., American Marietta Co., 104 East Ontario St., Chicago 11, Ill. Check the coupon for your copy of this helpful reference bulletin.

Main Cleaning Services You Need

85. A folder full of data on water main cleaning and rehabilitation plus reprints describing the experience of many cities is offered by National Water Main Cleaning Co., 50 Church St., New York 7, N. Y. Get this helpful material by checking the coupon.

For Fast, Smooth Pipe Cuts

92. The Wachs National air-powered saw cuts cast iron or steel pipe from 10" to 48" dia., leaving a clean-cut, milled edge. Guillotine-type saw handles smaller sizes. Get full information on these units from E. H. Wachs Co., 1525 No. Dayton St., Chicago 32, Ill., by using the coupon.

Pressure Pumps for Main Testing

82. Literature on the "Porto-Pump", a portable rubber-gear pressure pump for pressure testing water mains, applying main sterilizing chemicals, jetting operations, exploratory drilling, etc. is available from Porto-Pump, Inc., 277 Iron St., Detroit 7, Mich. Check the coupon.

Motor Buying Information Catalog

149. A 28-page catalog of buying information on a-c motors is available from General Electric Co., Schenectady 5, N. Y. Packed with helpful data, this booklet assists selection of fractional and integral horsepower motors in most general use. To get this booklet, GEC-1026, check the coupon today.

Purification of Swimming Pool Waters

153. An up-to-date 64-page manual on purification of swimming pool waters presents a comprehensive discussion of daily requirements, chlorine residuals and feeding methods for hypochlorites and HTH tablets. Available from Industrial Chemicals Div., Olin Mathieson Chemical Corp., Baltimore 3, Md. by checking the coupon.

What You Should Know About Filter Plant Gauges

156. Helpful data on filter plant gauges and the various types of meters used for filter plant operation are presented in a comprehensive 20-page booklet offered by Simplex Valve and Meter Co., 7 E. Orange St., Lancaster, Pa. A wealth of general information plus specifications and other pertinent data are included. To get your copy of this bulletin, No. 1002, check the coupon.

Specifications for Infiltration Galleries

159. Infiltration galleries, constructed by the Ranney method, are described in an attractive bulletin issued by Ranney Method Water Supplies, Inc., 841 Alton Ave., Columbus 19, Ohio. This bulletin, plus complete standard specifications for the construction of horizontal infiltration galleries, are available by checking the coupon.

Better Paving On Small Jobs

176. Blaw-Knox Company's small-job paving machine, the Adnun Jr. 8, is the subject of a new bulletin, No. 2609. The Adnun Jr. is equipped with a 12-HP motor. Hopper capacity is approximately 2 tons. It will pave an 8-ft. strip. For full engineering details and on-the-job performance data, get this bulletin from Construction Equipment Div., Blaw-Knox Co., Pittsburgh 38, Pa. Check the coupon.

Helpful Data on Pneumatic Flow Meters

178. The complete line of pneumatic flow meters offered by Builders-Providence, Inc., is covered in a convenient bulletin No. 285-G2A. Descriptions of this equipment, advantages and operation of transmitters, large dial gauges, summation units and controlled automatic pacing are included. Check the coupon or write Builders-Providence, Inc., 345 Harris Ave., Providence, R. I.

6-55

USE THIS COUPON to get detailed information on products and materials mentioned in this issue. Circle numbers below and mail today.

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92	93	95	96	101	103	105	109	118	119
123	126	132	134	137	142	143	146	149	153
154	155	156	159	163	168	176	178	179	184
186	188	189	191	196	197	205	207	211	212
216	217	220	223	232	235	236	238	239	241
242	246	248	255	266	267	274	277	278	295
298	303	305	309	311	317	324	326	329	332
336	341	343	344	349	351	355	358	359	361
363	364	366	368	371	372	375	383	387	392
397	398	404	405	406	416	418	419	420	421
422	429								

New Products, pages 216 to 221

6-1	6-2	6-3	6-4	6-5	6-6	6-7
6-8	6-9	6-10	6-11	6-12	6-13	6-14
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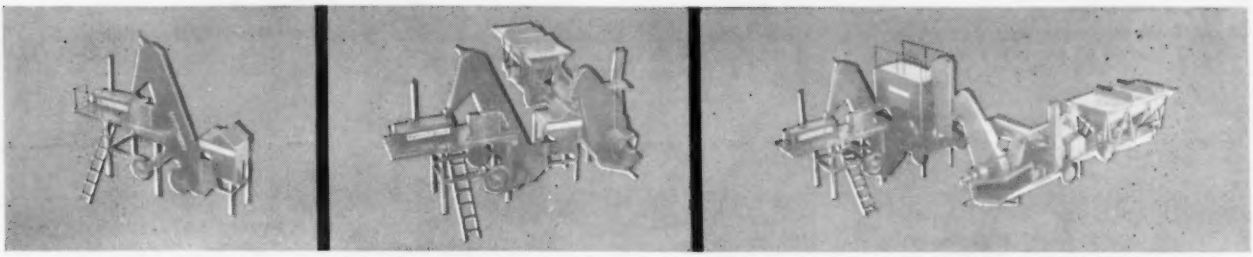


Cold Mix
Over 50 tons per hour with the 840-B *Mixer.*

Intermediate Hot Mixes
Up to 45 t.p.h. with *Mixer and Dryer.* (Shown with Cold Feeder.)

High-type Multiple Aggregate Mixes
Up to 45 t.p.h. with *Mixer, Dryer and Gradation Unit.* (Shown with Cold Feeder.)

NEW . . . Big Plant Flexibility at Low Initial Cost

WITH THE

NEW Barber-Greene 840-B Bituminous Plant

For a realistic low-cost initial investment you can have a plant that has the versatility for all kinds of jobs . . . from driveways to highways. The new 840-B interlocks aggregate and bitumen feeds for constant correct proportioning. The new, longer twin-shaft pugmill assures thorough mixing and increased capacities. Hydraulically operated pugmill discharge hopper allows plant to operate between trucks, and prevents mix segregation. The new high discharge lets trucks drive right under the hopper . . . eliminates a truck pit or special loading conveyor.

And this plant can travel. All units are mounted on pneumatic tires for towing at truck speeds. Adjustable jacklegs speed plant setup . . . eliminate cribbing.

Choose the Plant to Meet Your Needs

For an attractive initial cost you can have the new 840-B Plant you require. The mixer alone will set you up to produce stabilized base and cold bituminous mixes. Then, by adding other integrated Barber-Greene units—such as the dryer, gradation control, and dust collector, your plant can produce mixes to meet any specification. Check this new money-maker today.

55-4A-B

Barber-Greene

AURORA, ILLINOIS, U.S.A.

BG

WRITE for INFORMATION

descriptive literature . . . sound movies

cost studies . . . nearby job inspection . . . plant layouts

Now's the time to mail this month's Readers' Service card.

NOT GOOD AFTER JULY 15, 1955

To order these helpful booklets check the coupon on page 42.

Aerial Surveys and Maps from Photographs

179. Written in non-technical language, a 16-page booklet with this title gives a complete explanation of aerial surveys for the municipal field. Interesting step-by-step pictures show how planimetric and topographic maps, mosaics and atlas sheets are produced by Abrams Aerial Survey Corp., Lansing 1, Mich. Check the coupon for your copy.

Technical Supplement Describes Mixing, Coagulation and Flocculation

184. A new Technical Supplement issued by American Well Works, Aurora, Ill., provides full engineering data on slow mix equipment for chemical mixing, coagulation and flocculation. Design details, specifications and useful general data are included. Check the coupon for your copy.

Stop Sewage Plant Odor Complaints

137. Effective odor control for sewage treatment plants by use of "Orthosolv" is described in literature of Solvay Process Div., Allied Chemical & Dye Corp., 61 Broadway, New York 6, N. Y. Low cost, convenience and safety are important features. Get full data by checking the coupon.

Oversize Traffic Signals Get Results

142. 12-inch adjustable traffic signals are described in an information booklet published by Crouse-Hinds Co., Syracuse, N. Y. Complete construction and application data for stacks of three 12-inch sections or one 12-inch and two 8-inch sections are included. Check the coupon for your copy.

Chemical Mixers for Water and Sewage Treatment

46. Complete details on fluid mixing with both propeller and turbine type mixers of all sizes, provided in two comprehensive booklets of Mixer Div., Eastern Industries, Inc., East Norwalk, Conn. Check the coupon for your copy.

Reduce Labor Costs With Power Sewer Cleaners

189. A complete line of sewer cleaning equipment, including labor saving power units and all types of buckets, cables, rods and flushing equipment are listed in Catalog 10 of the Turbine Sewer Machine Co., Division of Chas. H. Stehling Co., 1303 N. Fourth St., Milwaukee 12, Wis. Check the coupon for your copy.

Flexible Coupling Speeds Vitrified Pipe Installation

311. Fast pipe laying with chemically inert, leakproof joints is made easy by Universal vitrified pipe with Tylox rubber joints. Full information on these materials and pipe laying methods is available from Universal Sewer Pipe Corp., 1500 Union Commerce Bldg., Cleveland 14, Ohio.

●

WATER WORKS

Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes, Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the coupon.

Technical Data on Fluorides And Other Chemicals

48. Technical data on fluorides and other chemicals will be found in a comprehensive booklet issued by Blockson Chemical Co., Joliet, Ill. This helpful 60-page booklet includes a great deal of general information of value to water works men. Get a copy by checking the coupon.

Helpful Data on Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included. Check the coupon today.

Helpful Reference on Swimming Pool Equipment

53. A complete reference catalog of swimming pool supplies chemicals and equipment is available from Modern Swimming Pool Co., Inc., 1 Holland Ave., Dept. PW, White Plains, N. Y. Detailed information covers filters and accessories, all types of fittings and equipment and helpful suggestions on chemical treatment and pool maintenance. Get your copy of this 44-page book by checking the coupon.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 55 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the coupon.

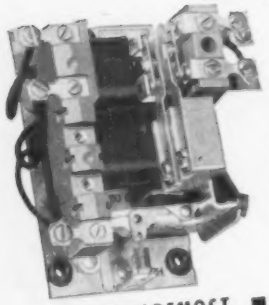
Dependable Source For All Chlorine Products

66. Get latest data on Jones chlorine service for liquid chlorine, calcium hypochlorite and sodium hypochlorite packaged in lots best suited for your needs. Five strategic locations serve all parts of the country. Check the coupon or write John Wiley Jones Co., Caledonia, N. Y.

B

FLOATLESS LIQUID LEVEL CONTROLS

W



● Catalog also covers Induction Relays, Relay Enclosures, Contactors and Starters, Multiple Pump Controls, Electrode Holders, Starter and Relay Combinations, Special Controls and Panels.

B/W CONTROLLER CORPORATION
2224 E. Maple Road
Birmingham, Mich.

FIRST and FOREMOST IN THE FLOATLESS CONTROL FIELD

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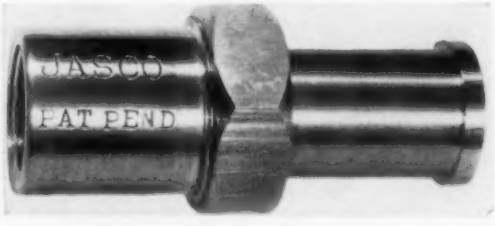
Keep Out of Tight Spots

INSTALLING OR REPLACING METERS



Use JASCO adjustable couplings. Give you room to work without strain on either the meter or connecting pipes when installing meter and gaskets.

Quick, simple, revolutionary. Pays for itself in time saved on first installations.

Get descriptive circular today.

JASCO PRODUCTS CO.
Dept. P, 8102 Bonner Drive, Houston 17, Texas

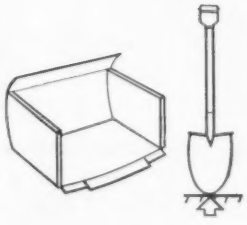
It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

Now's the time to mail this month's Readers' Service card.

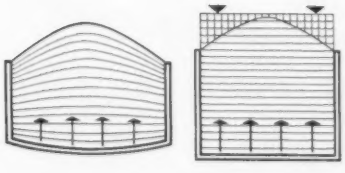
Outstanding, New Allis-Chalmers Earth-Moving Team: Model 315 scraper, with 20-yd heaped capacity, pulled by an HD-16 Tractor (150 net engine hp with torque converter drive, 131 belt hp with standard transmission drive).

Look At The Dirt-Moving Advantages of Allis-Chalmers Scrapers

Digs in Fast. Curved and offset cutting edge on Allis-Chalmers scrapers concentrates initial digging effort at center for faster penetration — as with a round-end, curved-bottom spade.



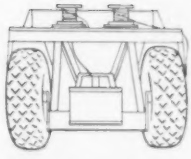
Loads with Less Resistance. Low, wide bowl reduces loading time, requires less power.



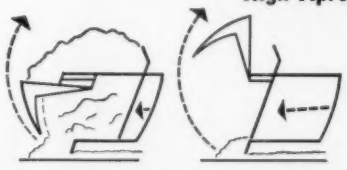
Heaps Loads with a Minimum of Spillage. Combination of deep center cut and correct angling of cutting edge loads the scraper with minimum spillage. "Boiling" action fills voids, produces automatically well-heaped loads.

Hugs the Ground for Stability. The wide, low bowl keeps scraper center of gravity low . . . wide wheel tread adds stability for working on slopes, grades, or rough terrain.

Hauls, Maneuvers Easily. Big, low-pressure tires provide maximum flotation. A short wheel base permits scraper to turn within its own length.

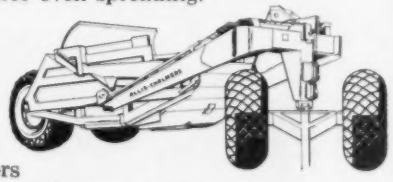


High Apron Lift Prevents Jamming. Apron lift is high — as much as 102 in. in the Model 315. Prevents any possibility of material jamming.



Dumps with Positive Ejection, Spreads Evenly. Ejector forces load forward, wipes bowl clean. Operator can control rate of discharge for even spreading.

Ground Clearance. Front-running gear has ample clearance. High carrying position of bowl enables Allis-Chalmers scrapers to clear ruts, windrows and other obstructions.



Model 315	Model 108	Model 106	Model 44*	Model 24*
15 yd struck 20 yd heaped	8.4 yd struck 11 yd heaped	6.1 yd struck 7.5 yd heaped	4 yd struck 4.7 yd heaped	2 yd struck 2 yd heaped

*Hydraulically controlled

COMPARE Allis-Chalmers scrapers with others, feature by feature, dollar for dollar, and you'll see why they are your best buy in every way.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

Get full details of this month's products . . . mail your Readers' Service card today.

To order these helpful booklets check the coupon on page 42.

Comprehensive Bulletin on Swimming Pool Equipment

73. Fully illustrated 12-page Bulletin WC-109 of the Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y., gives complete descriptions of modern filtering and recirculating equipment and accessories for the treatment of swimming pool water. Many indoor and outdoor pools and their equipment are illustrated, and typical flow diagrams show engineering details. For your copy check the coupon today.

Proper Installation of Bituminized Fibre Sewer Pipe

105. A well-planned instruction leaflet showing the proper step-by-step procedure for installation of Bermico bituminized fibre sewer pipe has been made available by Brown Co., 150 Causeway St., Boston 14, Mass. To make sure of best results in pipe installation, just check the coupon for your copy.

Bulletin Helps Specify A.W.W.A., Gate Valves

79. Double disc gate valves in 2" to 60" sizes are fully described in a 16-page bulletin which gives details on valve parts, design, materials, application of the "O" Ring Seal, operation and operating devices, directions for ordering valves and parts, dimensions of all sizes, and descriptions of eleven different methods for end connections. Valves for horizontal operation, square bottom valves, many types of gearing and gear cases, and a complete listing of special controls available are included. Get Bulletin A from Rensselaer Valve Co., Troy, N. Y. by checking the coupon.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

Locate Mains, Services and Leaks Without Digging

186. An 8-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes, cables, valves, manhole covers, conductive and non-conductive sewer pipes and septic tanks by electronic means. Dry battery operated. Only one man is needed for operation. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., by checking the coupon.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833-A. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Engineering Data on Tilting Disc Check Valves

196. The Chapman tilting disc check valve is designed to lift away from the body seat without sliding or wearing; closes without slamming. Operating principles, details of construction, dimensions, recommendations and engineering data are fully covered in 18-page Bulletin No. 30. Get your copy by checking the coupon or write to Chapman Valve Mfg. Co., Indian Orchard, Mass.

What You Should Know About The Centriline Process

197. The Centriline method for cement mortar lining water mains 16" thru 144" in place to stop leaks, prevent corrosion, increase carrying capacity and decrease pumping costs is fully described in a handsome booklet issued by the Centriline Corp., 140 Cedar St., New York 6, N. Y. Many illustrations and typical case histories show the operation and economies of this process. The Tate process for lining smaller mains is also covered. Check coupon for your copy.

Data on the Ratochlor Chlorine Dispenser

134. Complete descriptive literature on Ratochlor chlorinators which feature corrosion resistance, safety, dependability and direct, visible flow measurement is available from Fischer & Porter Co., Hatboro, Pa. Details of operation, applications and full engineering data are furnished. Write today or check the coupon for latest information.

What You Should Know About Fluoridation

217. A helpful publication entitled "Fluoridation" which describes the development of fluoridation and lists the chemicals and dosages normally used has been prepared by Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J. Copies of publications on both solution and dry feed W&T Fluoridators are also available. These publications are yours for checking the coupon.

Helpful Valve Catalog For Engineers

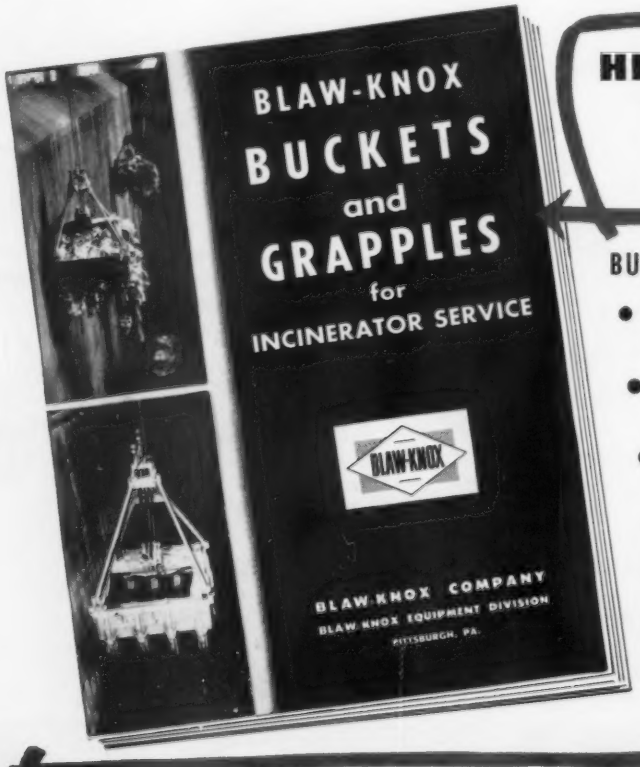
236. For complete descriptions of Darling double disc, parallel seat gate valves be sure to get Bulletin 5403 issued by Darling Valve & Mfg. Co., Williamsport, Pa. Construction details covering all valve parts and accessories are helpful for specification writers. Check the coupon for your copy.

All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use coupon or write to Fairbanks, Morse & Co., Dept. P. W., Chicago 5, Ill.

Helpful Data on Swimming Pools

364. Data on injector nozzles for complete recirculation, fittings for correct drainage and other useful information for pool design are covered in Manual SP issued by Josam Mfg. Co., Michigan City, Ind. Check coupon for your copy.



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- Do you allow *extra* headroom over hoppers for the refuse that hangs below the bottom of the bucket?
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IT ALSO INCLUDES TYPICAL SPECIFICATIONS

for your guidance in selecting the proper clamshell type bucket or tine type grapple. Write for Bulletin 2350-R today.

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light a city!

Pictured here is a portion of the Beloit, Wisconsin, downtown area where 20,000-lumen, 400-watt mercury-vapor lights yield an average of 1.5 foot-candles on the pavement . . . and 75% of the cost of this $58,052 lighting installation was supplied from revenues furnished by some 550 Magee-Hale PARK-O-METERS *

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**From American City Magazine, December 1954*

Thousands use our Readers' Service card to keep up to date . . . do you?

What You Should Know About Steel Reservoirs and Standpipes

163. In a handsome 24-page booklet "Horton Steel Reservoirs and Standpipes," the Chicago Bridge & Iron Co., Chicago 4, Ill., shows installations from 50,000-gal. to 10,000-000-gal. capacity with several types of roof and special architectural features. Engineering data includes information on capacities, foundations and improved surface protection. Check the coupon to get your copy.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Helpful Data on Butterfly Valves

238. A comprehensive catalog which furnishes full data on the design and application of Pratt Rubber Seat Butterfly Valves has been made available to designers and engineers by Henry Pratt Co., 2222 So. Halsted St., Chicago 8, Ill. Check the coupon for your copy of this excellent source of practical information.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

Manual Covers All Types Of Pipe and Service Repairs

266. Full details on the entire line of Skinner-Seal pipe repair clamps, service fittings and drilling equipment are presented in a new catalog and service manual offered by the M. B. Skinner Co., South Bend, Ind. Step-by-step installation pictures and captions give clear, concise instructions for the repair of all types of pipe leaks. Get helpful Catalog GW by checking the coupon.

Instrumentation and Control Equipment For Water and Sewage Plants

298. Full engineering data on the instrumentation and control equipment needed in water works, sewage plants, pumping station and related installations are provided in the "Application Engineering Data" binder issued by the Foxboro Co., Foxboro, Mass. Every engineer and designer should have this valuable material on hand. Check the coupon if you can use this data.

Engineering Data On Pressure Filter Design

329. A comprehensive bulletin describing Permutit's extensive line of pressure filters and their accessories is now available from The Permutit Co., 330 West 42nd St., New York 36, N. Y. Specifications, operating characteristics, outline dimensions and typical installation photographs are included in this 16-page publication. Get Bulletin 2225B by checking the coupon.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa. Get full details by checking the coupon.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Tips for Installing Orangeburg Pipe

336. Good practice for installation of Orangeburg pipe and fittings is outlined in an illustrated four-page bulletin made available by the Orangeburg Mfg. Co., Inc., 488 Madison Ave., New York 22, N. Y. Trenching and backfilling, pipe laying, cutting and connecting with other types of pipe are included. Use the coupon for your request.

For Prompt Service Use The Coupon

Reference Data on the Electric Check Valve

344. Comprehensive data on the new Double Cushioned Electric Check Valve which simplifies backflow control at pumping installations is contained in an 8-page technical bulletin, issued by Golden-Anderson Valve Specialty Co., 1244 Ridge Ave., Pittsburgh 33, Pa. Details on valve design for quiet, positive operation, dimensions, wiring arrangements and head loss are included. Check the coupon for Bulletin W-10.

Engineering Data on Lubricated Plug Valves

355. Full information on Homestead lubricated plug valves in full-port and venturi types, sizes up to 14", and with a choice of self-sealed two-piece plug or one-piece plug designs. Engineering information includes principal dimensions, types of control, metals, lubricants, etc. For your copy write Homestead Valve Mfg. Co., Coraopolis, Pa., or check the coupon.

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sunken curbs
gutters
driveways
sidewalks
street slabs

KOEHRING MUD-JACK® pumps soil-cement slurry under pressure into small holes drilled through pavement. This displaces air pockets, water, or water-saturated materials — raises the concrete slab — leaves solid, permanent sub-grade. How else could you do it? *Only with a Koehring Mud-Jack.* Two sizes: compact, portable No. 10 for city work (illustrated) — and big No. 50 for preventive maintenance and low-cost repairs on highways.

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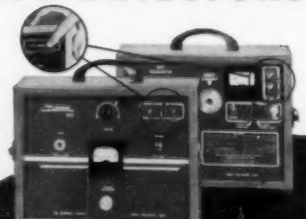
It's True There are Other "Good" PIPE DETECTORS



Model 505 Pipe Detector

and EACH ONE WILL PERFORM ALL THESE JOBS:

- Detect, trace and center pipes, cables, etc.
- Estimate their depth
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How long to bridge this 62-foot span . . .

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☐ 6 DAYS?
☐ 6 HOURS?
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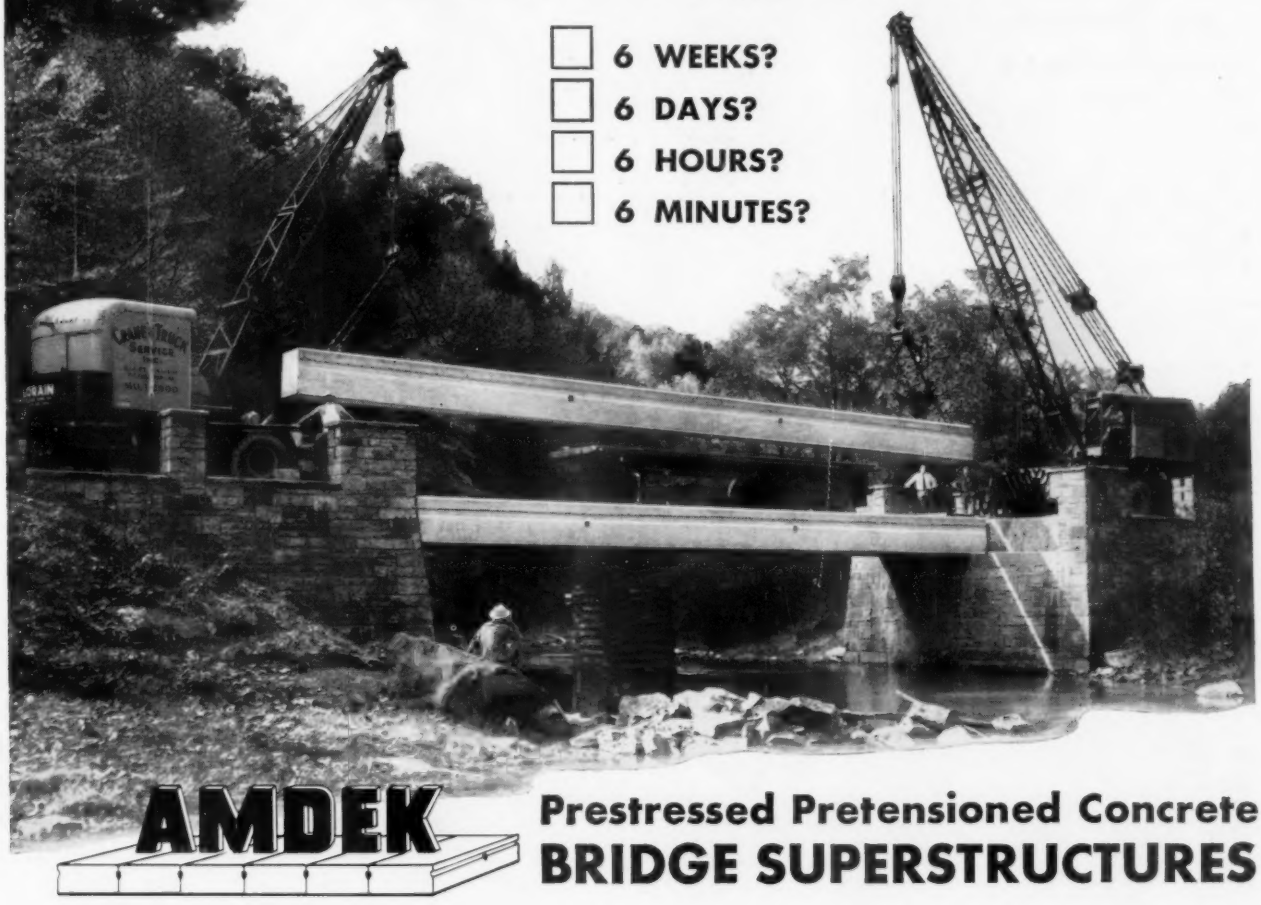

AMDEK Prestressed Pretensioned Concrete BRIDGE SUPERSTRUCTURES

6 HOURS! That's the remarkably short time it took a few workmen to span Laurelhill Creek near Somerset, Pennsylvania with the longest prestressed bridge in the state. Seven "factory-built" AMDEK sections were swung by cranes into position on offsets built into the old bridge abutments. After a few finishing touches, the bridge was ready for use!

Prestressing, pretensioning and vacuum processing—plus the use of hollow tubes—results in a stronger, lighter bridge member that can be handled by contractors like steel beams—in any weather. You save time, cut costs—build beautiful bridges that give perfect, maintenance-free service for years! Find out more about AMDEK Bridges . . . write for literature and all details.

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Empire State Prestressed Concrete Co.
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Oklahoma City, Okla.

Creaghan & Archibald, Ltd.
Montreal, Canada

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

Modern Filtration of Swimming Pool Water

351. Latest data on filtration systems for swimming pools of 50,000 gallon capacity and over is presented in 24-page bulletin No. 625 by R. P. Adams Co., Inc., 225 East Park Drive, Buffalo 17, N. Y. Design and operating data are provided, together with material to assist you in choosing the right filter for your pool. Check the coupon for your copy of this helpful bulletin.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Get latest data by checking the coupon.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y. Check the coupon for your copy.

Engineering Data on Asbestos Cement Pipe

372. Advantages of corrosion-free asbestos-cement pipe for water distribution plus full data on installation methods, cutting, making connections, testing, dimensions and weights are contained in the bulletin, and "Mains Without Maintenance," issued by Keasby & Mattison Co., Ambler, Pa. Get your copies by checking the coupon.

How to Clean and Develop Water Wells

375. The use of Weltone, which combines the cleaning power of Calgon with disinfecting and other chemicals in a safe, highly soluble powder is described in an interesting and informative booklet. For your copy of this descriptive literature write Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa. or check the coupon.

Cleaning and Relining Water Pipe the Easy Way

397. Complete facilities for relining cast iron or steel water pipe lines in place from 4" to 144" in diameter, with both the Tate process and the Centriline process, offered by Pipe Linings, Inc., 2414 E. 223rd St., Wilmington, Calif. For full information on cleaning and relining pipe with only momentary interruption of service, check the coupon.

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long. Check the coupon for your copy.

●

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

Packaged Sewage Treatment— Just Right for Small Places

36. "Pakage" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., Dept. J, 622 Diversey Pkwy., Chicago 14, Ill.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible, Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

High Rate Filters For Sewage Treatment

74. Accelerated biological oxidation in treatment of sewage and other organic wastes is a feature of Infilco's Accelo Filter system. Bulletin 6200 explains the direct recirculation principle, shows plant layouts, and gives performance data. For your copy write Infilco Inc., Box 5033, Tucson, Ariz., or check handy coupon.

Engineering Data on Screening Equipment

77. Water, Sewage and industrial waste screening equipment is fully described in a 28-page book, No. 2587, offered by Link-Belt Co., Dept. 137, Colmar, Pa. Complete data for the engineer and tables to determine the proper size unit for handling various capacities are included. This valuable, comprehensive booklet may be obtained by checking the coupon.

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Littleford-Clarkmoore Asphalt Road Heater-Planer
Heats and Planes in one continuous operation!
engineered unit for heating and planing bituminous roads, streets and runways
No other unit like it! This ingenious new machine—with one man at the controls, and in one continuous operation—heats and planes off high crowns, corrugations, eliminates troughs and ruts. Performs these and many other related operations as slowly as 1-ft. per minute, or as rapidly as 35-ft. per minute. For complete information send for bulletin 18.
Equipment with BUILT-IN ENGINEERING LITTLEFORD
Send today for Heater-Planer bulletin 18.
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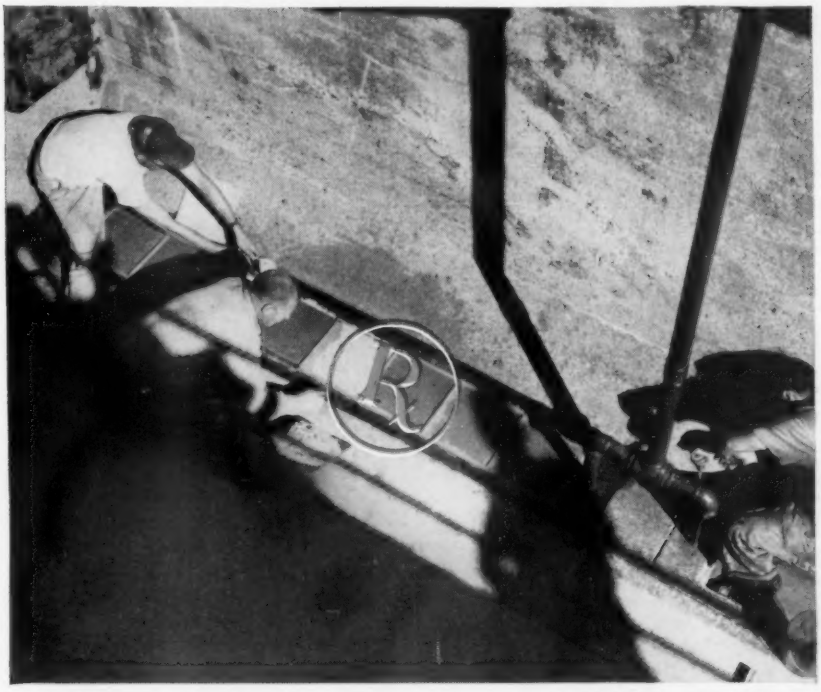
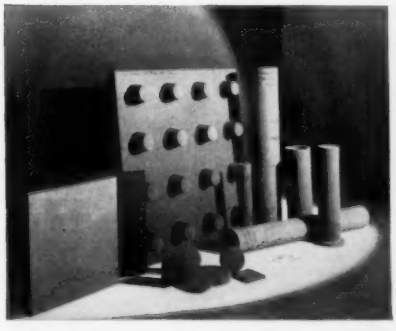
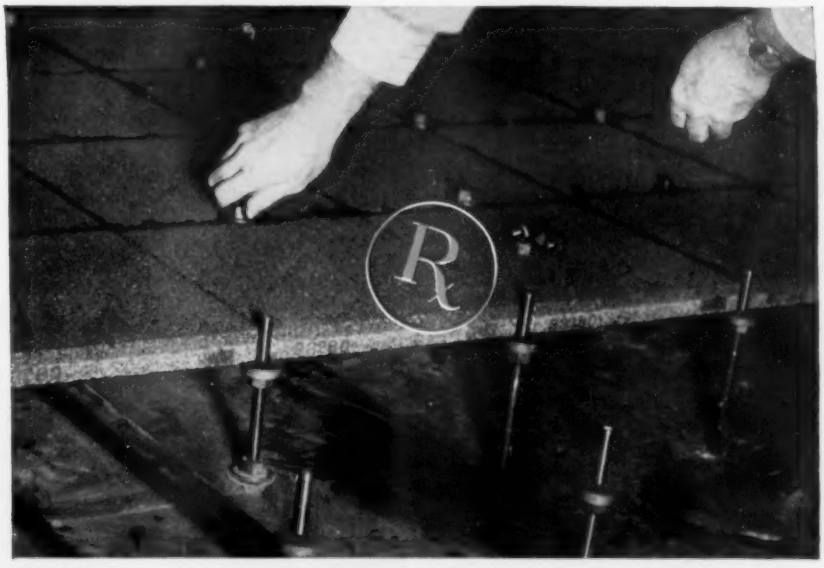
Two ways you save with Norton plates

NORTON ℞ (engineered and prescribed) porous mediums last extra-long, reduce maintenance in both sewage and filtration plants



After 16 years of service, Norton ALUNDUM* plates are replaced with new ones in a modern sewage disposal plant.





Good for many years to come. A water filtration plant makes sure of long, trouble-free service by installing Norton plates.

Public works engineers all over the country know that among the most dependable aids to efficient, economical sewage disposal and water filtration are Norton ALUNDUM porous mediums — *engineered and prescribed* for longest lasting, lowest cost performance.

Thanks to their *controlled structure* processing, Norton mediums have the even distribution of pores that makes them the ideal ℞ for uniform diffusion. And Norton tubes have this uniform diffusion over their entire area, because of their seamless construction — which also makes them much easier to clean.

You get additional savings with Norton porous mediums because of their exceptional resistance to breakage and chipping and to cleaning acids. Made in the form of plates, discs and tubes, they cover a wide range of applications, including activated sludge aeration and gravity, pressure or diatomite filtration.

Norton can help you by supplying illustrated booklets, charts, tables and other important information on your own use of porous mediums. Ask your Norton Representative or write direct to NORTON COMPANY, Refractories Division, 225 New Bond St., Worcester 6, Mass.

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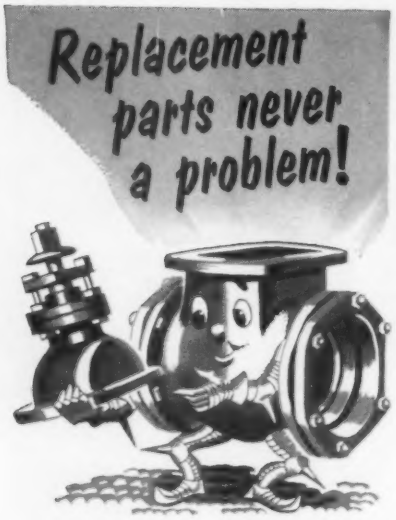

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Biofiltration Units for Small Scale Treatment

103. Complete sewage treatment on a small scale, suited for institutions, developments, turnpike restaurants and service areas and industrial waste applications is featured in Bulletin No. 7313 of Dorr-Oliver, Inc. Engineers, Stamford, Conn. Many engineering considerations are discussed, flowsheets show typical arrangements of units and applicable units are illustrated in detail cutaway drawings. Check the coupon for your copy.

Sewer Design Flow Chart Based on Manning Formula

154. A large-scale, convenient flow chart based on the Manning formula, together with typical examples of use, is available from Johns-Manville, 22 East 40th St., New York 16, N. Y. To get your copy check the coupon or write to the manufacturer and ask for Bulletin TR-94A.

Book Offers Help in Using Sewage Plant Gas

223. Means for the maximum utilization of gas generated in sewage plant operation are discussed in 20-page Bulletin C-5200 entitled "Rockwell Products for Sewage Disposal Plants," which is offered by the Meter and Valve Div., Rockwell Mfg. Co., 400 No. Lexington Ave., Pittsburgh 8, Pa. Full data on sewage gas meters, regulators and valves are included in this helpful bulletin. For your copy just check the coupon.

Chemicals Used in Water, Sewage and Waste Treatment

248. A 16-page technical bulletin No. 10-K12A offered by Omega Machine Co., 345 Harris Ave., Providence, R. I., compiles in convenient form full information on the chemicals, used in water, sewage and waste treatment. Data includes formulas, common names, commercial strengths, forms in which they may be obtained, sizes of shipping containers, and many other items, including recommendations for handling and feeding. Get this useful bulletin by checking the coupon.

Blower Selection Data Aids Sewage Plant Design

274. Characteristic curves for blower operation with constant-speed, multi-speed and variable speed motors; details of several types of blowers; data on accessories; and a discussion of advantages of positive displacement rotary blowers are provided in Bulletin RB-154 of Roots-Connersville Blower Div., Connersville, Ind. Get this helpful bulletin by checking the coupon.

Get the Facts on The Contact Aeration Process

303. Full engineering details on the submerged contact aeration process of sewage treatment, including diagrams of plant units, area requirements, operating costs and other details are available in a bulletin of the Hays Process Co., Box 768, Waco, Texas. Check the coupon to get the facts.

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 140 from Norton Co., Worcester 6, Mass. by checking the coupon.

Engineering Data on Gas Safety Equipment

343. P.F.T. Gas Safety Equipment for Controlled Digestion is the subject of an excellent 12-page bulletin issued by Pacific Flush Tank Co., Chicago 13, Ill. Full engineering data on flame traps, pressure releases, waste gas burners and related equipment is provided in convenient form. Requests for this valuable booklet must be made on business letterhead.

Design and Applications of the Spiragester

419. The Spiragester is a combination of a clarifier and a digester in a single unit, compactly arranged for economical construction and ease of operation. Full data on operation, explicit design information and specifications are included in Bulletin 135, issued by Lakeside Engineering Corp., 222 West Adams, Chicago, Ill. Check the coupon for a copy.

Engineering Data on The Spiraflo Clarifier

366. Helpful engineering data on the Spiraflo clarifier are presented in 8-page Bulletin 6791 by Yeomans Brothers Co., 1999 N. Ruby St., Melrose Park, Ill. Details on operation of the unit, performance data, typical plan and elevation, detention time curve and mechanical specifications are included in this useful publication. To get your copy just check the coupon.

Combat Unpleasant Odors At Municipal Sanitation Sites

404. Malodors at municipal refuse disposal sites, waste treatment plants and incinerators may be effectively "neutralized" by the odor masking products of Rhodia, Inc. Be sure to investigate this means of eliminating complaints from unpleasant odors. Write Rhodia, Inc., 230 Park Ave., New York 17, N. Y. or check the coupon.

WEED & DUST CONTROL

What You Should Know About Chemical Weed Control

132. In a convenient 44-page book, the C. B. Dolge Co. gives full details on spraying procedures and chemicals to use for control of lawn and roadside weeds, ragweed eradication and insect control in turf. Get your copy by checking the coupon or write C. B. Dolge Co., Westport, Conn.

Weed Killing Case Histories

205. Weed and grass control lasts longer . . . costs less with Du Pont "Telvar" weed killers. Interesting folder published by Grasselli Chemicals Dept., E. I. Du Pont de Nemours & Co., Inc., Wilmington 98, Del. Full color photographs demonstrate effective action; text shows application methods for best results. Check the coupon for your copy.

Powerful Mist Sprayer Controls Pests

241. Mist sprayers for shade tree and mosquito control, roadside weed control sprayers and a full line of pressure pumps, engine equipment and spray guns in assemblies for every spraying need are presented in an illustrated catalog by Hardie Mfg. Co., Hudson, Mich. Get 40-page Catalog No. PC 57 for data on all types of chemical spray and dust equipment. Check the coupon.

Dust Control Made Easy

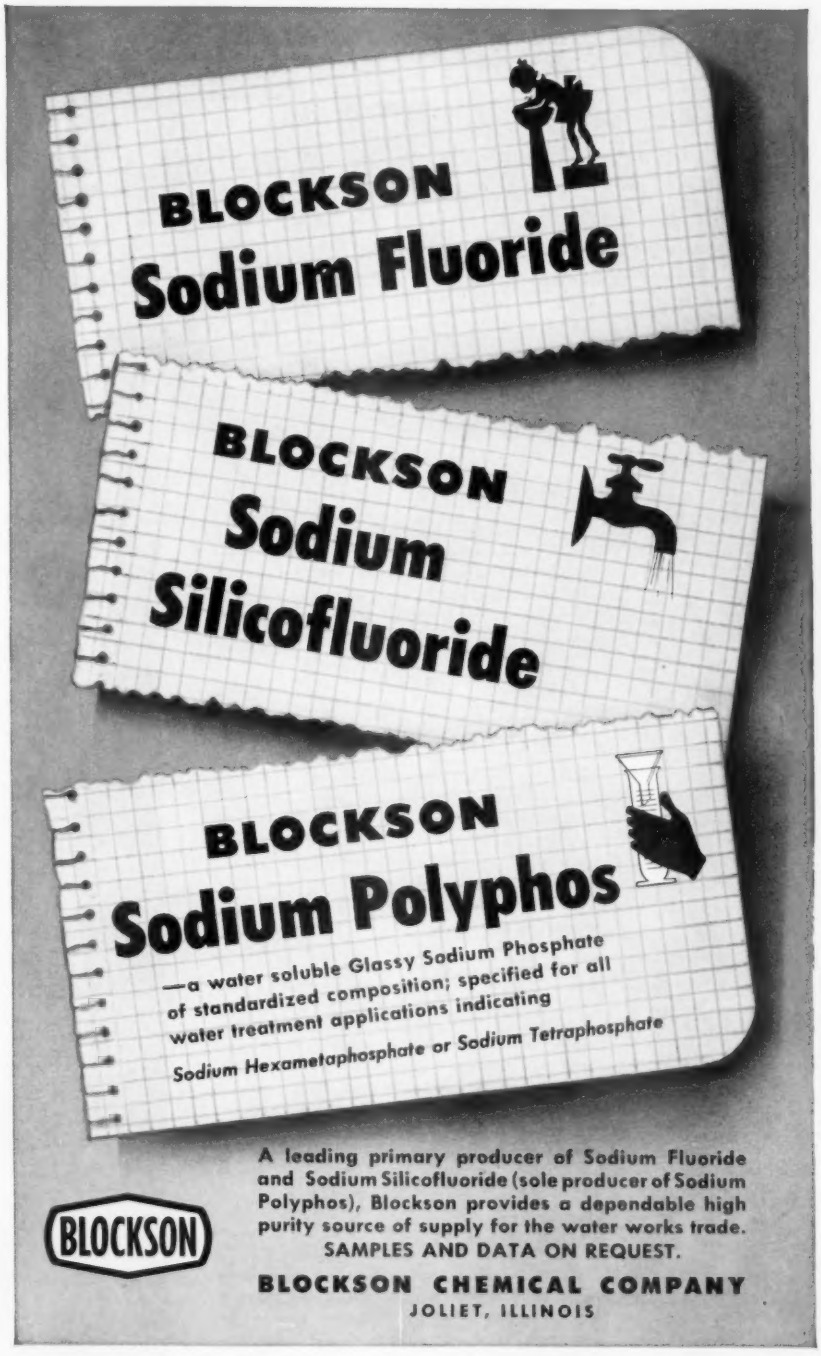
416. Details on an effective solution for your dust annoyance problems are presented in a colorful bulletin, "Gulf Sani-Soil-Set—the modern, proven agent for controlling dust." Get your copy to learn how this long-lasting, easily applied material can be of help. Write Gulf Oil Corp., 1822 Gulf Bldg., Pittsburgh 30, Pa. or check the coupon.

Chemicals Regulate Growth of Grass

420. To retard the growth of grass on highway shoulders and other areas where mowing is a heavy maintenance expense the use of a chemical, MH-40, is suggested by Naugatuck Chemical Div., Naugatuck, Conn. Full details on application and typical results are provided in Bulletin No. 17, available by checking the coupon.

Dustproofing Roads with Calcium Chloride

429. Elimination of dusty road problems, reduction of aggregate loss and savings on road blading operations are discussed in the bulletin "Wyandotte Calcium Chloride for Dustproofing." Also included are helpful data on quantities required for many types of surfaces. Write Wyandotte Chemicals Corp., Wyandotte, Mich., or check coupon for a copy.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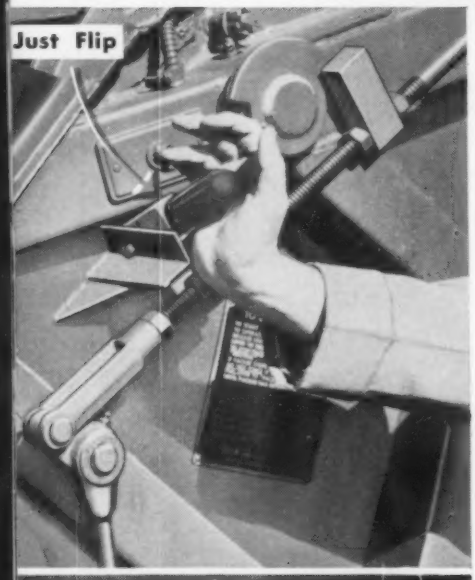
22 Important Improvements

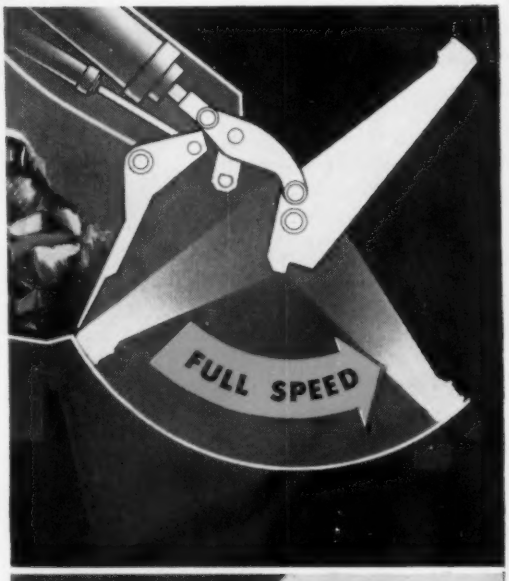
have been made in the LOAD-PACKER*

Gar Wood, long the leader in fully-enclosed, sanitary refuse collection units, now offers an even greater Load-Packer. It is the result of two years of engineering, field study, and testing, plus many years' experience with thousands of similar units already in service. To all the time-tested features which made Load-Packer so successful, have been added 22 major changes which make this unit an even better buy. All these improvements are now standard on current production models at *no extra cost* to you.

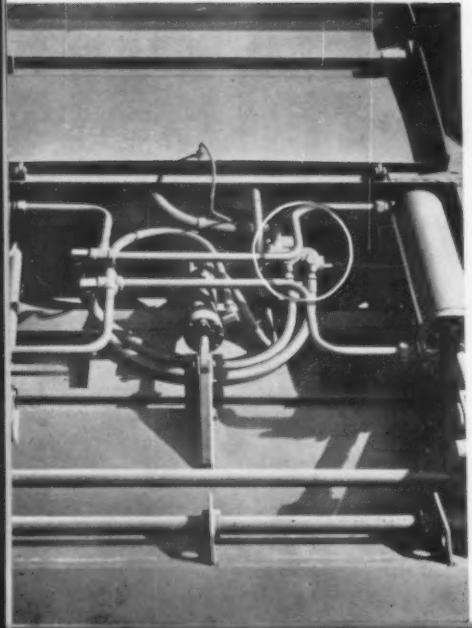
Here are the highlights!



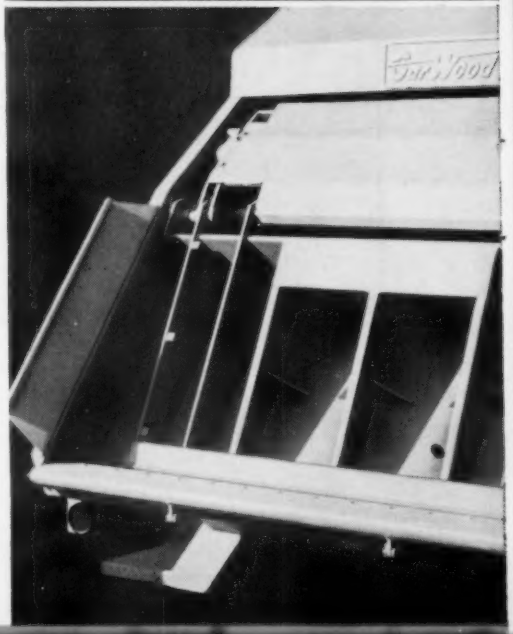
Instant Automatic Biggest news is the new "Safte-Matic" control which makes Load-Packer operation fully automatic. Just one effortless flip of new release lever starts the automatic cycle. Ram-door compacts refuse into body...then re-opens for next load. Crew spends less time operating machine, more time collecting refuse.



Faster Hopper Opening Ram-door opens faster at *full engine power*. This plus automatic compaction cycle adds up to more refuse collected per day. Low-level loading, at truck frame height, means less physical effort to lift and dump heavy containers. Extra wide hopper permits crew to load from both sides without interference.



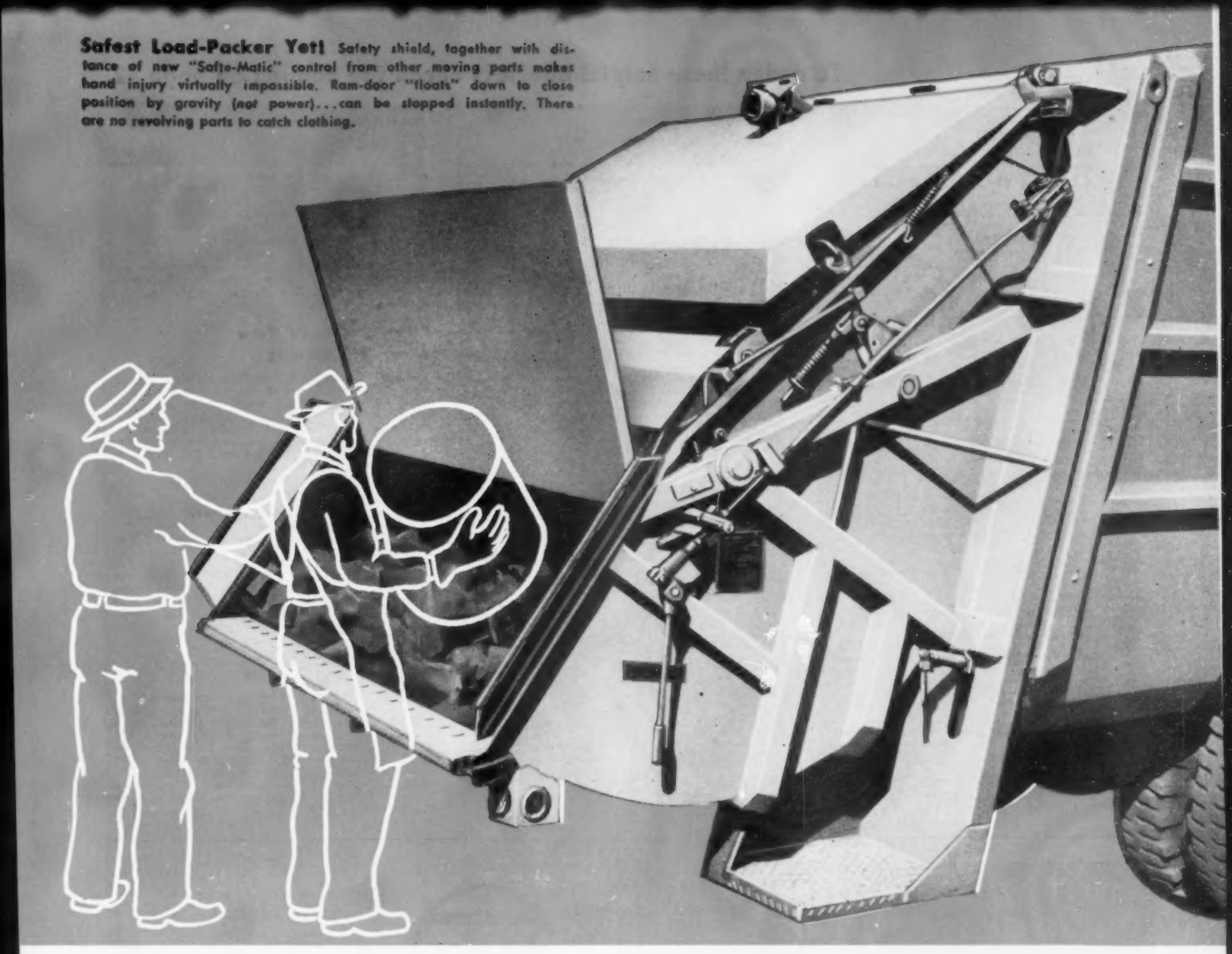
Simplified Hydraulic System One valve instead of two now operates both ram-door and retainer panel. Less hose, less tubing, much simpler adjustment. High-pressure return hose is wire-wrapped for longer service. Operating costs are reduced, servicing takes less time and is easier.



Strongest Load-Packer of All

Entire Load-Packer structure has been reinforced. Extra ribbing makes ram-door a welded box structure, reduces chance of distortion. New ram through-shaft supported at center and at both sides eliminates high socket stresses. Tailgate hinges are stronger. Heavy gusset brackets welded to side panels of ram-door give better hinge support. Retainer panel brackets are heavier. Upper cross channel, supporting both the tailgate hinges and ram jacks, has been strengthened by a heavy Z-section channel. Side panels are welded to the Z-section with heavy gussets. Extra hopper side braces give strong support, better control lever attachments.

*Load-Packer is the registered trademark of Gar Wood Industries, Inc.



Safest Load-Packer Yet! Safety shield, together with distance of new "Safte-Matic" control from other moving parts makes hand injury virtually impossible. Ram-door "floats" down to close position by gravity (*not* power)...can be stopped instantly. There are no revolving parts to catch clothing.

In addition to the many improvements in structure and controls, you get all these job-proved basic features which have made Gar Wood Load-Packer the leader in the field:

Tremendous compaction that adds up to 200% extra capacity per cubic content of body

Fully enclosed, odor and leak-proof

Low-level loading that reduces crew fatigue

Wide hopper that speeds loading, eliminates spillage

Short wheelbase for close maneuvering and sharp turns in narrow streets and alleys

Large, safe riding steps to eliminate walking, speed up collections

Clean, smooth lines to prevent branches from catching in Load-Packer body

Tapered body for fast, clean dumping

Lower maintenance and longer life

A size to fit your need. . . 10, 13, 16, 20, and 24 cu. yd. capacities

You can depend on the new Gar Wood Load-Packers. Earlier models serve almost 40,000,000 people in more than 2600 communities. There are 4 times as many Load-Packers in use *as all other makes combined.*

For details, call your Gar Wood distributor or branch or write:

GW-LP-8

GAR WOOD INDUSTRIES, Inc.

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Load Packer is the regular equipment of Gar Wood Industries, Inc.

To order these helpful booklets check the coupon on page 42.

STREETS AND HIGHWAYS

Bitumuls Paving Handbook Full of Useful Data

23. The latest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the coupon. American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 4, Calif.

Tractor-Backhoe Combination Offers Big Returns

30. Features of the Allis-Chalmers Model WD-45 wheel tractor equipped with Henry backhoe and other Henry hydraulically operated attachments are outlined in an attractive 8-page catalog now available from the Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, Wis. In addition to specifications, the catalog includes illustrations of the basic unit and of various Henry front and rear mounted attachments plus details of the tractor itself. Get Catalog MS-982 by checking the coupon.

8 Reasons Why You Should Check the Jaeger Loader

207. In a profusely illustrated 16-page catalog devoted to the applications and special design features of the Jaeger "Load-Plus" tractor-loader unit, eight good reasons listed to back up the claim that this machine outproduces any other loader of its size. These include load capacity, balance, reach, maneuverability, automatic power adjustment by torque converter, instant reversal, multiple speed and ease of control. Check them all by getting a copy of Catalog L100-3. Check the coupon today. Jaeger Machine Co., 400 Dublin Ave., Columbus 15, Ohio.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio.

Be Sure to Investigate These Parking Meter Features

146. Parking meters designed for greater public convenience, unlimited flexibility with easy adjustment of time limit rate and coin acceptance plus simplified enforcement inspection are described in the attractive bulletin of Magee-Hale Park-O-Meter Co., Commerce Exchange Bldg., Oklahoma City 2, Okla. Get all details on the Model H meter by checking the coupon.

Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

Trenching Equipment Data Conveniently Assembled

212. The entire line of Cleveland trenching and backfilling equipment is now covered in a single bulletin, with material arranged for quick comparison of capacities, specifications and dimensions of all models. Twenty-four action photos graphically illustrates various job applications. Get Bulletin S-120 now for easy review of your trenching equipment needs. Just check the coupon or write to the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

How Aerial Surveys Fill All Map Needs

235. A clear explanation of the technique of aerial topographic map production is given in "Air Speeds Your Map Needs." Striking photographs trace aerial photos step-by-step to the final maps for highway location, city and regional zoning and planning, traffic studies, drainage and watershed projects, tax maps and many other types of work. Use the coupon to get this excellent booklet for public works and planning officials. Jack Ammann, Photogrammetric Engineers, 829 N. St. Mary's St., San Antonio 2, Texas.

What You Should Know About Soil Sampling

255. Acker Soil Sampling Catalog No. 25 contains a complete and thorough collection of information about soil sampling in all types of sub-surface conditions. Modern sampling techniques are discussed together with recommendations as to tools and accessories. Write Acker Drill Co., Inc., Scranton, Pa., or check the coupon.

Give Full Protection To Treated Poles and Timbers

267. Bolt holes in treated poles and timbers used for guard rails and structures can easily be the first point of decay. Now you can assure maximum life by using the Greenlee Bolt Hole Treater, a simple device that forces preservative into the wood cells. Bulletin 13-15 gives the details. Greenlee Bros. & Co., Rockford, Ill.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem, reduce troublesome brush and trimmings to tiny, easy-to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16-page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass., or check the coupon for your copy.

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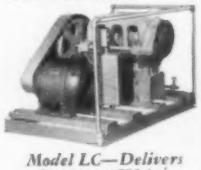
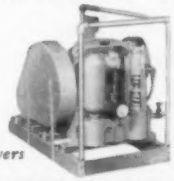


Model LC—Delivers 50 gpm at 800 psi.



Model XCVA—Delivers 18 gpm at 600 psi.

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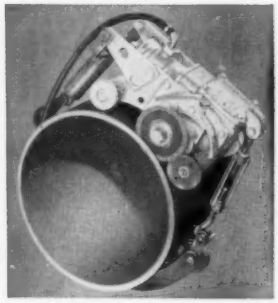

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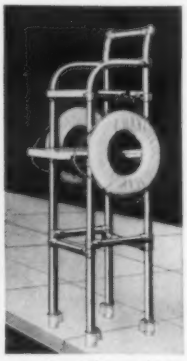

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93. Be sure to investigate the hydraulically operated ground drive offered by Baughman to give you the advantages of two drive speeds and uniform distribution of material regardless of truck speed, but without the need for power takeoff or transmission. Full data on this and many other features in Form A-380. Baughman Mfg. Co., Jerseyville, Ill.

How the Mobil-Sweeper Can Improve Street Sweeping

305. Sweeping costs can be cut with the Mobil-Sweeper which features safe highway speeds up to 55 mph, carries 2 2/3 cu. yd. dirt hopper, sweeps swath up to 10' wide with full floating brooms. Hills and deep gutters are no obstacle. Write to the Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif. or use coupon for complete details on this machine.

Auxiliary Equipment For Use with the "Jeep"

326. Be sure to investigate the versatile "Jeep" as a source of auxiliary power in combination with convenient transportation. Power take-off operates air compressors, generators, other equipment. For details write to Willys Motors, Inc., Toledo 1, Ohio, or check the coupon.

Better Drainage for Streets and Highways

358. Irving "Dryway" Draingrates provide maximum drainage openings for catch basin inlets, across-the-road drains and centerline drains. Light weight, strength, economy and corrosion resistance are a few of the many features offered. Full descriptive details on both riveted and pressure locked type are furnished in an illustrated bulletin by Irving Subway Grating Co., Inc., 50-09 27th St., Long Island City 1, N. Y. Check the coupon.

Two-Way Radio Equipment For All Departments

363. The benefits of two-way radio communication in the uncongested non-interference 450-megacycle range make full information on this subject important to all engineers. Get full data on trouble-free systems from Motorola Inc., Dept. PW, 4545 Augusta Blvd., Chicago 51, Ill. Just check the coupon.

How Counties Benefit By Motor Grader Investments

418. County commissioners tell how they have invested taxpayers' money in equipment for highway maintenance, and report savings from these investments in the booklet "Caterpillar Motor Graders—An Investment of Taxpayers' Money," published by Caterpillar Tractor Co., Peoria 9, Ill. For a copy of this booklet, Form D518, check the coupon.

Effective Sweeping for Cleaner Streets

421. Outstanding features of Wayne Model 450 Sweepers are described in an attractive folder which covers operating advantages and general specifications. Data on dual control models are included. For your copy write Wayne Mfg. Co., Pomona, Calif., or check the coupon.

●

REFUSE COLLECTION AND DISPOSAL

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check coupon or write Gar Wood Industries, Inc., Wayne, Mich.

Engineering Data on Incinerator Design

118. A comprehensive bulletin which provides full engineering data on municipal refuse incineration is offered by Pittsburgh-Des Moines Steel Co., 3422 Neville Island, Pittsburgh, Pa. This 20-page booklet shows basic requirements for satisfactory incineration, gives incinerator design details and describes modern mechanical stoking, construction features and modernization of existing plants. Get your copy by checking the coupon.

Why Cities are Shifting to Pak-Mor Collection Bodies

216. Reduced costs of refuse collection with 12 to 50 yard bodies; faster loading; dense compaction; quicker emptying; sealed doors and simple controls are among the advantages cited in 16-page booklet describing Pak-Mor refuse collection equipment. Get full data from Pak-Mor Mfg. Co., Box 6147, San Antonio, Texas, or check the coupon.

New M-B Packer Body Designed for Maximum Payload

309. The M-B Packer Body, designed to provide maximum payload on a minimum size, low-cost truck, features effective, simple compaction system; provides easy loading, positive discharge, all safety features. Available in 12-14-16 yd. capacities. Get all the facts from M-B Corporation, New Holstein, Wis. by checking the coupon.

Efficient Landfill Operations For Small Communities

349. Step-by-step photos and concise text are used in a bulletin of the Oliver Corp., to show the construction and operation of a sanitary landfill, using equipment especially suitable for the smaller community, the Oliver OC-3 Tractor-Loader. Besides providing economical refuse disposal, many other jobs handled by this unit are suggested. For a copy, write to the Oliver Corp., 400 W. Madison St., Chicago 6, Ill. or check the coupon.

Check These New Features On Refuse Collection Bodies

383. The all-new Heil "Collectomatic" refuse collection unit incorporates the best features suggested by municipal operating crews, supervisors and private operators to provide easy loading, simple operating mechanism, bulldozer type packing, fast dumping and many other important advantages. Check them all by getting attractive Bulletin BH-54103 from The Heil Co., 3044 W. Montana St., Milwaukee 1, Wis. Your copy is ready—just check the coupon.

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CONSTRUCTION EQUIPMENT AND MATERIALS

What You Should Know About Air-Placed Concrete

67. For a detailed explanation of the principle of "gunned" or "air placed" concrete and description of the improved Model 750 and 1250 Bondactors, be sure to get your copy of Form 553 from Air Placement Equipment Co., 1011 W. 24th St., Kansas City 8, Mo. Check the coupon today.

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, is available from Reed Mfg. Co., Erie, Pa. Check the coupon.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

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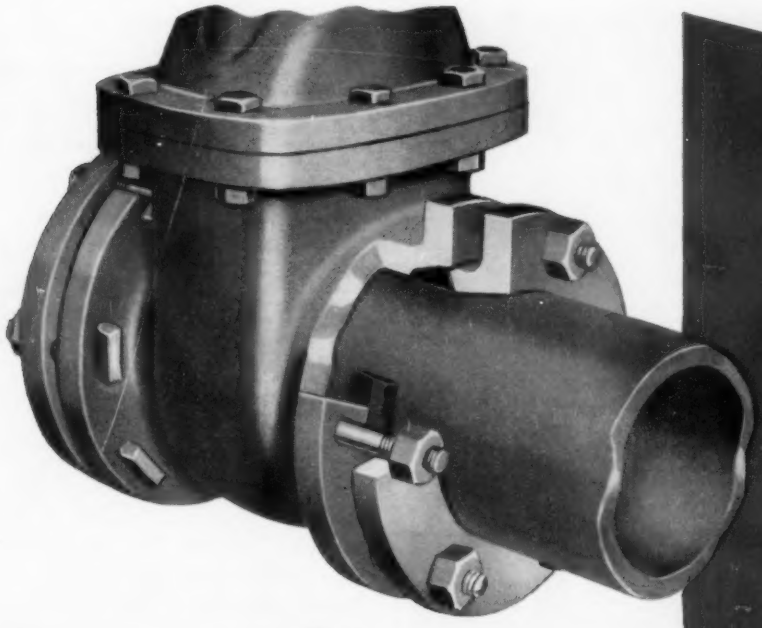

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Useful Attachments for "Payloader" Tractor Shovels

95. Increased versatility for Hough "Payloader" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade snow plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc. Check the coupon today and full details will be sent.

Complete Protection Of Iron and Steel Products

242. What are the advantages of Hot-Dip Galvanizing? Why does it offer complete protection at such an economical cost? You'll find the answers in the attractive booklet "Stop Rust", which gives you the full story of the process plus a comprehensive coating comparison chart. Get your copy promptly by checking the coupon or write American Hot-Dip Galvanizers Assn., Inc., 1st National Bank Bldg., Pittsburgh 22, Pa.

Getting Specified Density In Granular Bases and Fills

188. Vibratory compactors offer the means for getting specified density in rock, slag, soil-bound macadam, gravel and sand base courses. Just one pass may suffice. Get complete information from Jackson Vibrators, Inc., Ludington, Mich. See how adaptable compactor units handle a variety of compaction needs. Check the coupon today.

Complete Booklet on Pipe Line Equipment

246. Equipment for all types of jointing, maintenance and repair jobs on water, gas and sewer lines is described and illustrated in Catalog No. 25 issued by Joseph G. Pollard Co., New Hyde Park, N. Y. Leak detectors, pipe finders, melting kettles, cleaning tools and a full line of hand tools for water and sewer departments, and many other items are included. Be sure to get your copy now. Just check the coupon.

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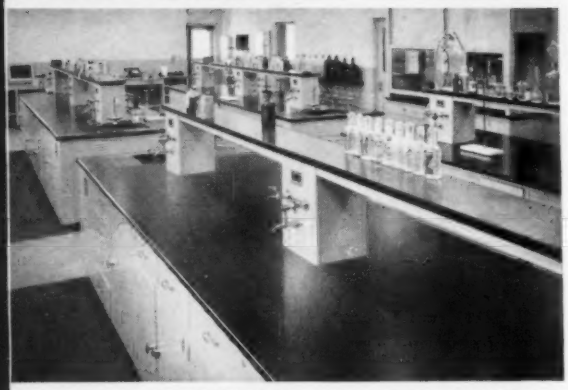

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Better Highways Through Salt-Soil Stabilization

123. Shoulder stabilization is the subject of a new booklet in the series of informative pamphlets issued by International Salt Co., Inc., Scranton, Pa. Step-by-step illustrations show construction procedures in detail. For practical information on this important subject check the coupon today.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

Comprehensive Data on Bulldozers

232. Hydraulic Bullgrader and bulldozer blades for International crawler tractors are described in a 24-page catalog published by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. All features are fully described, complete specifications are included and many illustrations show on-the-job operations. Check the coupon for your copy.

Heavy Duty Compressor Designed for Smaller Jobs

295. A new four-page bulletin illustrates and describes many exclusive Le Roi features found on the 85 cfm Airmaster. Engine and compressor are of one-unit design and provide construction features rarely found in the smaller compressors. Ease of operation, maintenance and mobility allows the 85 to do more hard, heavy-duty work. To get full data write to Le Roi Div., Westinghouse Air Brake Company, Milwaukee 14, Wis., or check the coupon.

Faster Cuts in Concrete Pavement

317. Clean, fast cuts in green or cured concrete and asphalt pavements are easily made with the powerful Champion concrete saw. Perfect balance and "either-side" blade arrangement helps speed the work when sawing joints and cutting outlines for patches. Get full details from Champion Mfg. Co., 2028 Washington Ave., St. Louis 3, Mo. Just check the coupon.

Portable Sump Pump Needs No Priming

324. The BJ Pneumatic Sponge Pump, a self-contained air-powered unit, is built for heavy duty dewatering use on all construction jobs. Full details on this lightweight portable sump pump are contained in Bulletin No. 543-3-900, available from Byron Jackson Co., Box 2017, Terminal Annex, Los Angeles 54, Calif., or by checking the coupon.

Economical Scraper Handles Many Heavy Jobs

398. Among the many applications of the versatile Model D Tournapull are: grading and building roads; handling garbage disposal; and grading, leveling and terracing. For details on how its speed, power and ability to work either as a self-loading tool can help your production and lower your costs, write Le Tourneau-Westinghouse Co., Peoria, Ill., or check the coupon.

CIVIL DEFENSE

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago, Ill., by using coupon.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif. Get latest data by checking the coupon.

STREET LIGHTING AND TRAFFIC CONTROL

Investigate These Street Lighting Standards

54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy coupon. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigar Iron Works, 1033 Herman St., Nashville, Tenn

Convenient Data on Traffic Signs and Markers

126. A complete line of traffic control devices, including stop signs, warning signs, regulatory signs and danger signals is presented in the fully-illustrated catalog of the Grote Mfg. Co., Bellevue, Ky. Helpful excerpts from the "Manual on Uniform Traffic Control Devices for Streets and Highways" are included. Get a copy by checking the coupon.

Fast Marker for Traffic Guide Lines

155. Free-floating, adjustable paint shields on the Mark-Rite Econo-Liner follow surface contours and produce sharp lines in any width from 2" to 6". This machine is said to paint 10,000 to 15,000 feet of line per hour. For details get Form E-100 from Universal Mfg. & Sales Co., 5211 Pacific Blvd., Huntington Park, Calif.

For Prompt Service Use The Coupon

Comprehensive Data on Lamps for Street Lighting

387. Complete technical data on lamps for street and highway lighting is given in an 8-page booklet, S-413, issued by the Lamp Div., Westinghouse Electric Corp., McArthur Ave., Bloomfield, N. J. Designed as a selection guide, the booklet presents information on all lamps in common use. Four special charts give data on mercury lamps and series and multiple lamp types. Check the coupon for this handy reference.

Traffic-Actuated Controls For Every Intersection Problem

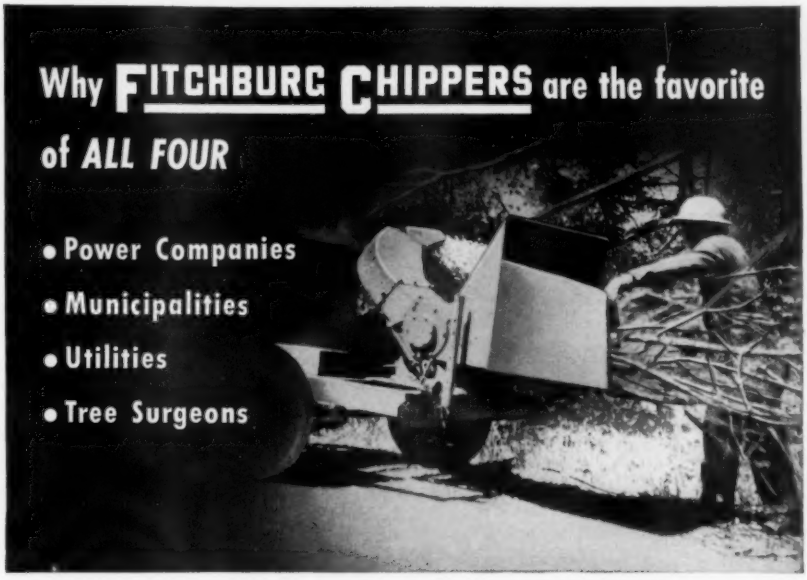
392. Traffic control systems which continually adjust to changing patterns to relieve congestion at every type of intersection are fully described in a comprehensive set of bulletins available from Automatic Signal Div., Eastern Industries, Inc., East Norwalk, Conn. Whether your problem involves side roads entering main arteries, complicated street intersections, speed controls or other situations, you will find helpful information in this literature. Check the coupon today.

How to Save on the Cost of Signs

405. Sign costs have been reduced significantly by many cities, counties and states that switched to Alcoa aluminum for signs and markers. Strength and corrosion resistance cut maintenance costs; aluminum fasteners mean trouble-free installation. For full material specifications write Aluminum Company of America, 1978-D Alcoa Bldg., Pittsburgh 19, Pa., or check the coupon.

Comprehensive Bulletin Covers All Sign Needs

406. Data on warning and regulatory signs, street name signs, devices, posts and reflector buttons are furnished in comprehensive Catalog 54 of the Cataphote Corp., Toledo 10, Ohio. You'll find information on all your sign needs, including button, sheeting and beaded reflectorization in this helpful booklet. Get your copy by checking the coupon.



Solves Brush Disposal

Instant brush disposal—right on the spot! That's why so many leading power companies, municipalities, utilities, and tree surgeons now cut disposal costs—chip brush, branches, trimmings with powerful Fitchburg Chippers. Eliminate hauling, burning—with its fire hazard, extra labor, inconvenience. No waiting. Chip in any weather, wet or dry. Here's a clean, acceptable method of disposal that wins public approval and good will.

Saves You Labor

Read what users say. From a Missouri utility line clearance firm: *"One man can operate the chipper with ease. He alone can handle as much and more brush in the same length of time as could two men loading brush on a platform body."* From a Connecticut tree expert: *"This chipper has cut our brush disposal in half. It has eliminated brush dumps and fires completely."* One large Ontario power customer reports a saving of 25% in man hours expended per tree as a result of equipping their crews with Fitchburg Chippers.

Increases Your Production

In Oregon the Roadmaster for one county said: *"This Fitchburg Chipper has paid for itself twice over the first season."* Another chipper user on Washington State Highways reports that with a crew of three men they can clean up at least a half mile of heavy brush in six hours. A Missouri utility line clearance firm says: *"Our figures show that production has been increased by a good 25% with a Fitchburg Chipper."*

Stays Out of the Shop

Read what satisfied users say. Connecticut: *"The Fitchburg Chipper has never cost us one minute of delay."* Ohio: *"We now have ten of your Fitchburg trailer type chippers. Doing a good job—from the looks of them they will last for many years."* New York: *"Our men are particularly pleased with Fitchburg Chippers. They are rugged and reliable."*

FREE BOOK GIVES FACTS

READ the actual letters from which the quotations above were taken. Free, colorful, Fitchburg booklet gives full data and specifications—gives actual names, companies, places. Send for it now—it's free.

FITCHBURG ENGINEERING CORPORATION
Dept. PW-65, Fitchburg, Massachusetts

Please send Fitchburg Chipper booklet.

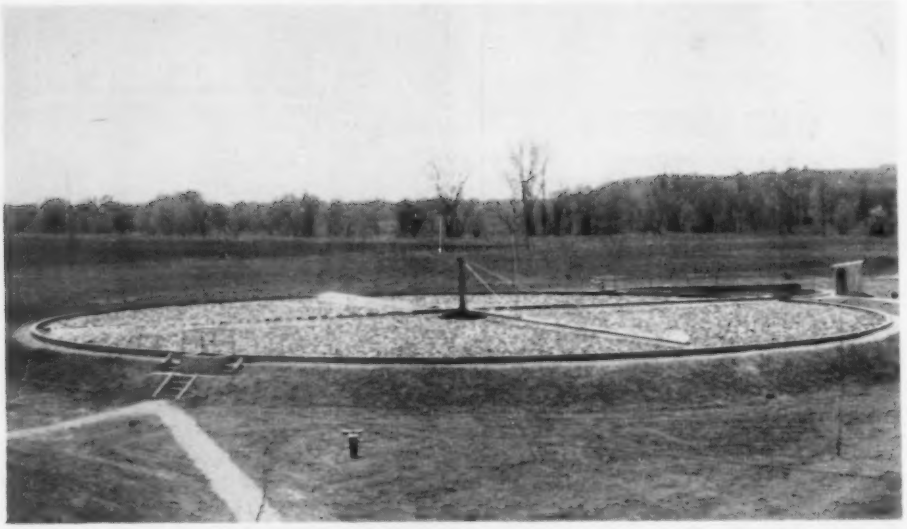
*Name*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

Why Trickling Filters are best for

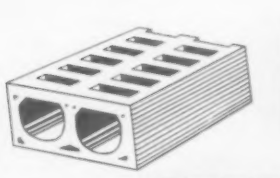


125 ft. trickling filter recently completed at Independence, Mo. Dickey blocks were used, Haskins, Riddle & Sharp of Kansas City were the engineers and Utilities Engineering & Construction Co. of Oklahoma City were the contractors.

GOOD RESULTS:

If you want Top-notch efficiency—say 20 ppm BOD—day after day, year after year, use trickling filters. Your consulting engineer can design them to produce whatever quality of effluent you need—not only now, but for many years in the future.

And the best trickling filters use *vitrified clay filter bottom blocks.* The reasons for this are fully described and illustrated in the new edition of the popular HANDBOOK OF TRICKLING FILTER DESIGN, revised to 1954. If you lack a copy, write any member of the Institute for yours. It's free.



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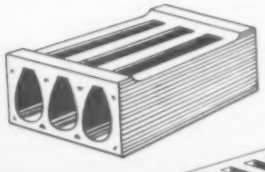

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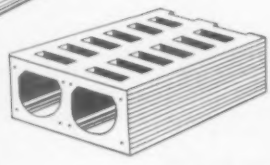
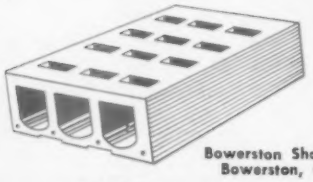
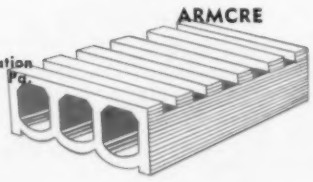




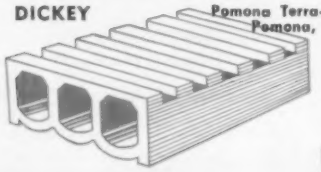
TRICKLING FILTER FLOOR INSTITUTE

Bowerston Shale Co., Bowerston, Ohio
Cannelton Sewer Pipe Co., Cannelton, Ind.
Texas Vitrified Pipe Co., Mineral Wells, Tex.
Natco Corporation, Pittsburgh 22, Pa.
Pomona Terra-Cotta Co., Pomona, N.C.
W. S. Dickey Clay Mfg. Co., Kansas City 6, Mo.
Ayer-McCarel Clay Co., Inc., Brazil, Ind.

DICKEY

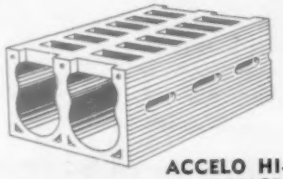


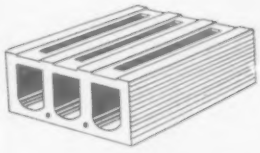
ARMCRE



TRANSLOT

CANNELTON





ACCELO HI-CAP* (ARMCRE)

POMONA

*Reg. Trade Mark of Infilco Incorporated.

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THE CLAMP WITH THE Sealed Gasket and ¾" Bolts!

SKINNER-SEAL Bell Joint Clamps stop bell and spigot joint leaks under pressure. Speedy one-man installation cuts repair costs.

Gasket is completely SEALED and protected; at the bell face by a Monel Metal Seal Band; at the spigot by hard, vulcanized gasket tip, acting as a plug. Equalized pressure forces gasket into every crevice in the joint, sealing the leak at its source. Sturdy malleable iron Compression and Anchor Rings—shaped and pressure-tested before shipping. Large ¾" bolts. Plated or unplated. Malleable iron bolts furnished on special request.

M. B. SKINNER CO.
Est. 1898
SOUTH BEND 21, INDIANA

SKINNER-SEAL BELL JOINT CLAMP

Now's the time to mail this month's Readers' Service card.

It's Not TOO LATE!

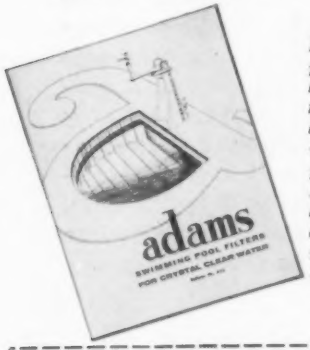
Your pool can still be inviting . . . appealing . . . this season.

Now you've opened your pool to the public, maybe you have found the old filters just can't handle the heavy bather load . . . your water looks murky . . . swimmers don't come back—and you know how people love to find fault and talk.

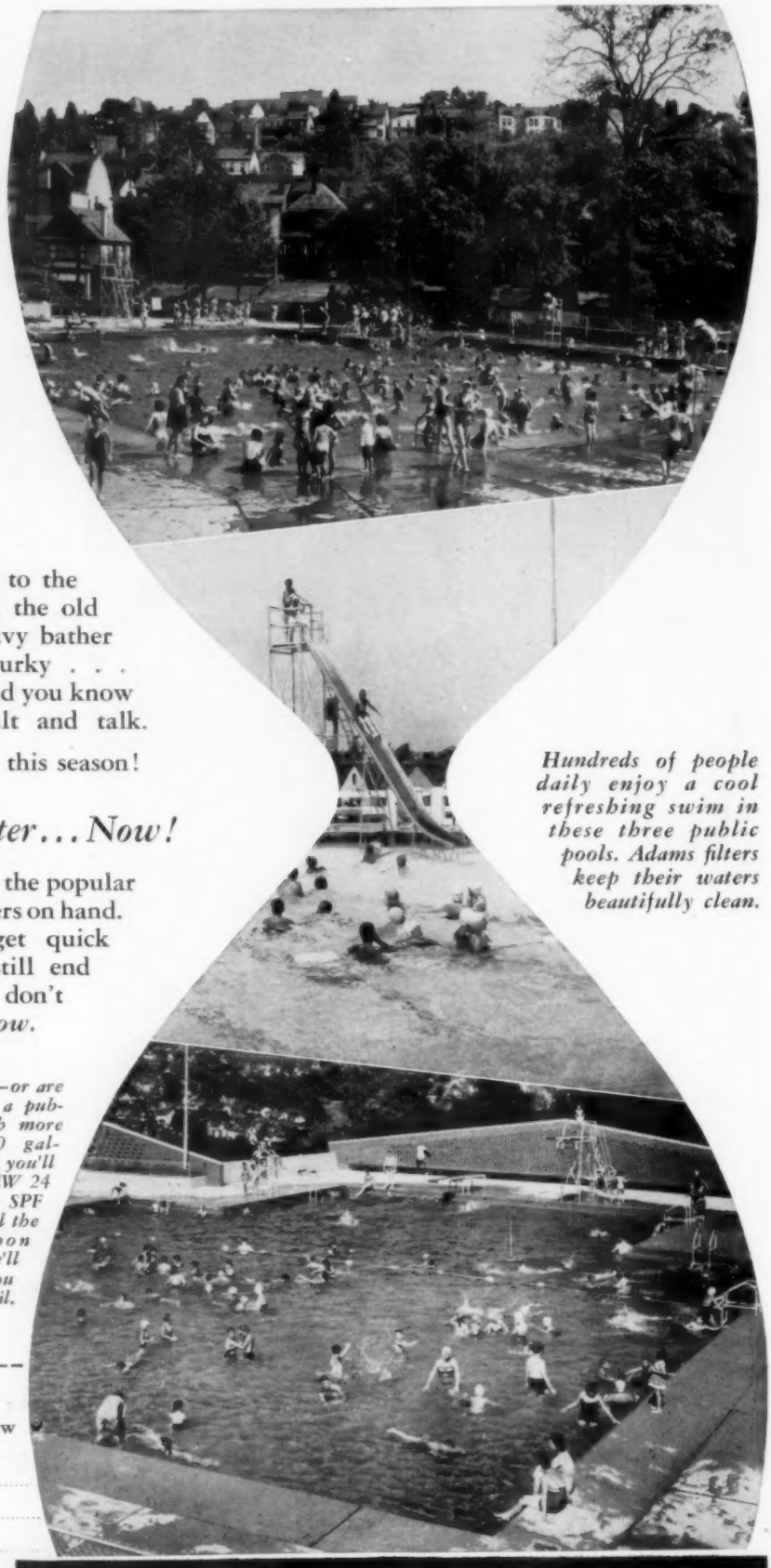
You still have a chance to save this season!

Order your Adams Filter... Now!

We keep a stock of most sizes of the popular Adams SPF swimming pool filters on hand. You can order today and get quick delivery. Chances are you'll still end up ahead for the season. But don't delay. It's not too late — *now.*



If you have—or are planning — a public pool with more than 50,000 gallons capacity, you'll want this NEW 24 page Adams SPF Bulletin. Mail the handy coupon below and we'll rush it to you by return mail.



Hundreds of people daily enjoy a cool refreshing swim in these three public pools. Adams filters keep their waters beautifully clean.

R. P. ADAMS COMPANY, INC.
228 East Park Drive, Buffalo 17, N. Y.
Please send me by return mail your new Bulletin 625.

Name.....
Title.....
Business.....
Street.....
City..... *State*.....
Size of pool is..... *gallons.*

R. P. ADAMS CO., INC.
228 East Park Drive Buffalo 17, N. Y.

Now's the time to mail this month's Readers' Service card.

Chosen in the West. "Century" Pipe is shown as it is installed at Lake Almanor, Calif. The piping will be a part of the water system at Lake Almanor Country Club Estates.

Chosen in the East. This photograph shows "Century" Pipe being laid in the hard, rock-filled soil of New England near South Hadley Falls, Mass. Today, more and more value-conscious communities are specifying this durable, long-lasting pipe.

13 miles of long-lasting pipe! Pictured here is part of a 13-mile installation of "Century" Pipe at the Lakewood Water District near Tacoma, Washington. Made of two practically indestructible materials, asbestos and cement, "Century" Pipe assures *extra* years of low-cost service.

Across America, K&M "Century"® Pipe is Stabilizing Pumping Costs

Because K&M "Century" Asbestos-Cement Pipe is non-tuberculating, highly resistant to corrosion, and immune to electrolysis, the diameter of its bore never changes. Consequently, there is *no creeping up of pumping costs.*

Durable "Century" Pipe, formed on a smooth steel mandrel, has a smooth interior surface offering a minimum of friction. The Williams and Hazen Constant "C" is conservatively placed at 140. As it is relatively light in weight, machinery for handling up to and including 12″ pipe sizes is not needed.

Leakage problems also vanish! Permanently tight joints are made possible by the use of "Century" Simplex Couplings. The pipe also meets the A.W.W.A., A.S.T.M., and Federal specifications for asbestos-cement pressure pipe.

Write for FREE booklet, "Mains Without Maintenance." We'll also be glad to help you with any installation problem in your specific operation.

See us at Booths No. 11 and 12, American Water Works Association Convention in Chicago, June 12-17.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

K&M best in asbestos®

Get full details of this month's products . . . mail your Readers' Service card today.

Now's the time to mail this month's Readers' Service card.

Still MORE PROOF of the LOW Maintenance Costs with DORR CLARIFIERS

Cranston, R. I. Repair Parts Costs Data

No. of Units	Size & Type of Clarifiers	Years of Operation	Total	Repair Parts Cost: Per Unit	Repair Parts Cost: Per Unit Per Year	Repairs as % of: Original Cost	Repairs as % of: Original Cost Per Year
2 2 3	50 ft. Type SUZ 60 ft. Type SUZ 26 ft. Type AG Sludge Thickeners	12	$390.30*	$55.76	$4.65	1.55%	0.129%

*The $390.30 includes $181.00 or 46% of the total repair parts cost for spare parts which are still in stock and have not been used for replacement.

Figures tell the story . . . and the actual operating records in Cranston, R. I. are additional testimony that Dorr Clarifiers operate dependably and cost less to maintain.

Maintenance costs are one of the primary factors upon which Clarifier excellence should be judged. Are you getting the best?

We'd like to tell you how Dorr Clarifiers stack up on performance too. Ask a Dorr Engineer for the facts.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

Need more facts about advertised products? Mail your Readers' Service card now.

Would you like to save $54,000?

City of Signal Hill eliminates leakage, restores flow coefficients, saves money with cement mortar lining of pipeline "in place"

In 1932, the City of Signal Hill installed an 18", twelve-gauge pipeline in the Orange Ave. area. By 1940 leaks became numerous. Over the next 14 years, various remedial measures were taken, but all failed to work satisfactorily...the City was forced to consider replacing the line.

Finally, in 1954, money was available to do the job. Mr. George I. Osborn, water superintendent for the City, was instructed to ask for bids.

Low bid for new line...$80,367.20

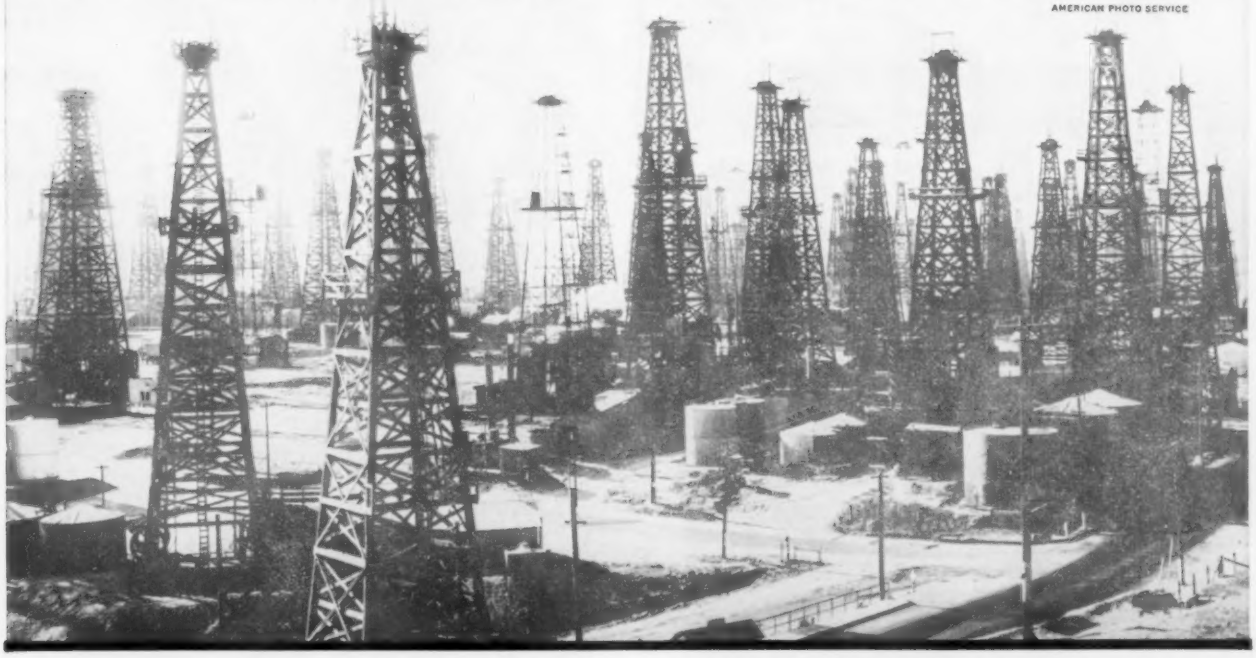
Eight organizations submitted bids. Low bid was $80,367.20...high bid $94,964.04. Meanwhile, Mr. Osborn recommended that flow coefficients could be restored and that equivalent service could be obtained much more economically by lining the existing pipe with cement mortar by the Centriline Process.

Work of lining existing pipeline... $54,000 less!

Bids were requested on lining the existing pipeline. Pipe Linings, Inc., got the job. The work of placing a 5/16" cement mortar lining on 7208 feet started on August 23, 1954. The crew was finished, cleaned up, ready to go home on September 7, 1954 ...the job completed in 12 working days. Mr. Osborn states "The decision to cement line the pipe in place was reached for two reasons: (1) Success of other agencies in lining their pipe and (2) the low expense involved as compared to new installation. In addition, we are sure that 90% of the confusion with traffic and other hazards that we would have encountered in laying a new line was eliminated for the following reasons: (1) Existing pipelines crossing our pipe were not encountered so the possibility of breaking or damaging them was eliminated. (2) Existing driveways were not blocked and crossing boards were not necessary. (3) The nuisance from dust was greatly reduced because of the little amount of excavation necessary."

And...the lining job cost $54,000 less than the best bid submitted for a new 18" pipeline.

AMERICAN PHOTO SERVICE



You reap the advantages! Lining of pipelines "in place" gives new pipe performance, prevents leakage, restores full flow coefficients, reduces pumping and maintenance costs, and protects against corrosion, contamination, and water discoloration.

A Pipe Linings, Inc., representative will be glad to discuss your problem. No obligation!

Write today (on your organization letterhead) for our *new* catalog...Cement Mortar Lining of Pipelines "In Place."

PIPE LININGS, Inc.

Specializing in Pipe Protection Problems • Interior Cement Mortar Lining • Somastic ® Exterior Pipe Protection • Pipe Wrapping • Centrifugal Spinning of Cement Mortar Linings in the Plant • Pipe Reclamation

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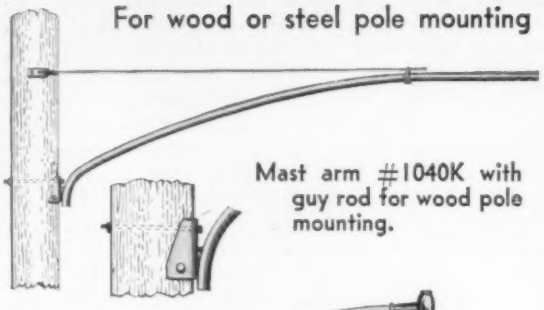
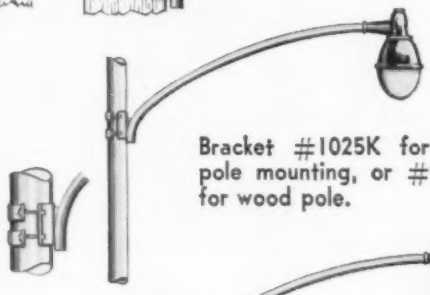
KERRIGAN Weldforged
TRADE MARK
Steel Brackets & Mast Arms

For Economy & Beauty

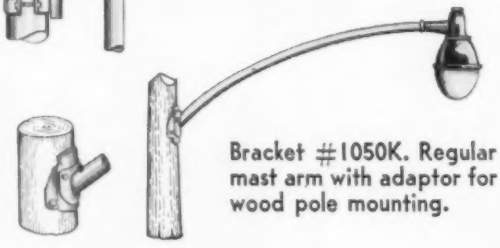
For wood or steel pole mounting



Mast arm #1040K with guy rod for wood pole mounting.



Bracket #1025K for steel pole mounting, or #1035K for wood pole.

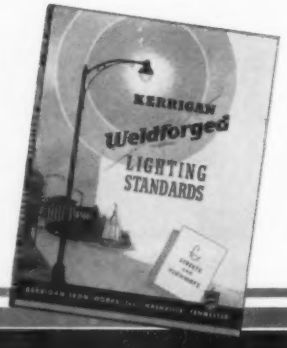


Bracket #1050K. Regular mast arm with adaptor for wood pole mounting.

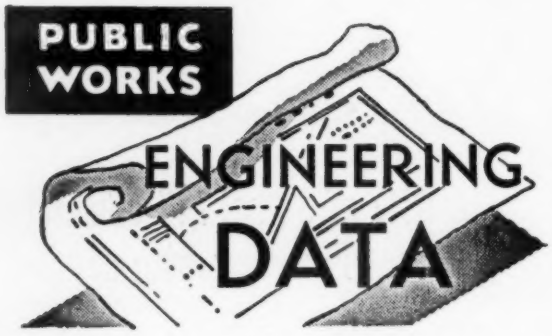
Kerrigan's complete line of brackets and mast arms are carefully engineered for easy installation and wiring. They meet all I.E.S. street lighting recommendations. So, take advantage of your wood poles now in place and brighten up your city or town NOW!

Let us help you

solve your city's lighting problems. Send for our FREE catalog containing engineering data. It shows how simple installation really is.



KERRIGAN IRON WORKS, INC.
Nashville, Tennessee
Gen'l. Sales Office — 274 Madison Ave. — N.Y.C.



Procedures for Regulating Moving Houses over Roads

Approximately 600 houses were moved over Wayne County, Mich., roads during 1954. House moves are covered by permits issued by the Highway Maintenance & Service Division. Before such permits are issued, a detailed study is made to determine the proper routes to be taken. Cash bonds are deposited with the Board to guarantee repair to any damage within the right-of-way which might occur as the result of moving operations. The charges for raising traffic signals, repairing trees, etc., are deducted from this bond and the balance refunded to the licensee upon satisfactory completion of the move.

Painting Centerlines in North Carolina

The North Carolina State Highway Commission painted 14,237.1 miles of white centerline on North Carolina highways last year, Traffic Engineer Robert A. Burch reported. Much of the work was repainting lines rubbed off by traffic or on roads which had been resurfaced.

At least 6,000 miles of usable centerlines did not require repainting last year. So with 14,237.1 miles painted last year, the State now has approximately 20,000 miles of well-centerlined highways.

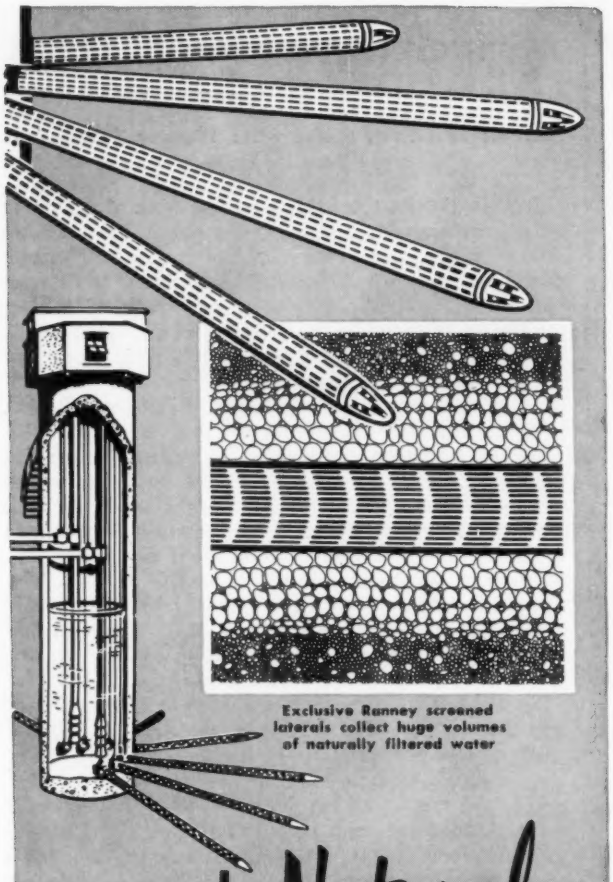
Another 6,552.3 miles of yellow warning or "no passing" lines were placed. Yellow lines are placed where the sight distance for a motorist is 600 feet or less.

While it takes about 6.45 gallons to paint one mile of highway, a total of 180,847 gallons of paint were used for all purposes last year. For greater night visibility, the paint is premixed with reflectorized beads which shine at night. A reflectorized centerline adds safety to night driving.

The Commission follows the nationally recommended standards of 15 feet of white paint line with a 25-foot skip between. It saves paint but gives the same effect as a continuous line.

Odorizing Digester Gas As A Safety Measure

The "Pentalarm" system installed in July, 1950, at the Detroit, Mich., sewage treatment plant for odorizing digester gas has proven valuable in locating gas leaks so they can be repaired before hazardous conditions develop. The effectiveness was demonstrated in March, 1954, when the underground high pressure gas line broke outside the boiler room, allowing seepage of gas through wall sleeves into the basement. The odor was readily detected and the break located and repaired before a dangerous condition developed—1954 Annual Report.



Exclusive Ranney screened laterals collect huge volumes of naturally filtered water

The Ranney Method Assures a Pure, Sanitary Water Supply

Natural Filtration

The RANNEY METHOD, by Natural Filtration, produces water of better chemical quality than ground water . . . as proven by the many RANNEY installations now in operation. Each delivers millions of gallons per year of clear, non-turbid water at lowest cost. The RANNEY method reduces, or eliminates entirely, costly filter plants. If you need an efficient, economical water supply...

...write

RANNEY METHOD

Water Supplies Inc.

Water Supply Engineers and Contractors

841 Alton Columbus 19, Ohio

DEPT. PW-3

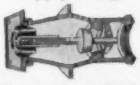
Associate:
Ranney Method Western Corp.

POOLS and BATHERS say "Thank You" for Josam SWIMMING POOL FITTINGS

● Josam Swimming Pool Fittings maintain highest standards of sanitation and hygiene for bathers . . . keep pool water in tip-top condition by providing a continuous supply of clean water through complete circulation and proper drainage. No wonder pool owners everywhere are enthusiastic about their "Josam-equipped" pools. In the Josam Manual SP-5, free upon request, you can select typical plans and layouts covering supply fittings, gutter drains, overflows, outlets, vacuum connections, hair and sediment interceptors and other necessary fittings which will meet the requirements of every condition in every community. If you are building or remodeling, send coupon today for your free copy—it is the "Authority" in the Swimming Pool drainage field.

For RECIRCULATING SYSTEM POOLS

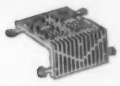
Series No. 0700-B Injector Supply Fitting



Series No. 0730-B Supply Fitting with Control Valve

Series No. 0380-1 Main Outlet Drain

For WATER LEVEL DECK POOLS



Type No. 0297-B Skimmer Grill and Access Grate

Series No. 0298 Skimmer Fitting with Flow Control

Type No. 0291-B Deck Trench Grate

JOSAM MANUFACTURING COMPANY
GENERAL OFFICES
MICHIGAN CITY, INDIANA

JOSAM MANUFACTURING COMPANY
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ZIPS THROUGH THEM ALL!

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☑ CURED CONCRETE
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CS 500 CONCRETE SAW
Perfectly balanced and maneuverable with a powerful 14.6 h.p. engine.

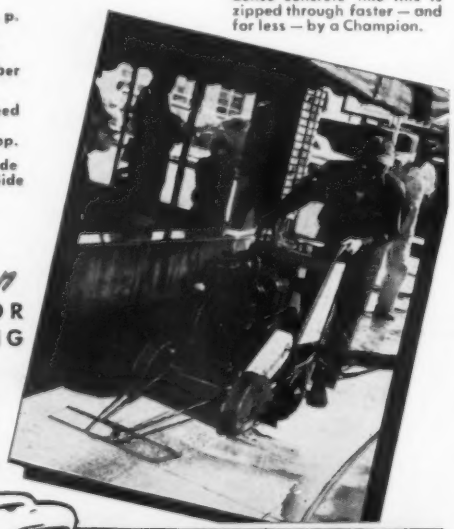
EASIER-FASTER-CHEAPER!

Champion
CONCRETE SAWS

This rugged, yet compact Champion harnesses 14.6 horses to get clean, straight bites in asphalt, green and cured concrete. Champion's compact and perfectly balanced design produces speedy cuts, saves important on-the-job time and labor costs, maneuvers easily in confined areas... cuts right into closest corners with Champion's "either-side" blade arrangement. Ask your distributor about the Champion or write direct. Champion's labor and money-saving features are worth checking into!

Sidewalk Patching with a Champion. Even well-cured, dense concrete like this is zipped through faster — and for less — by a Champion.

- Powerful 14.6 h. p. Gasoline Engine.
- Non-Sway Ball-Bearing Solid Rubber Wheels.
- Positive Screw Feed with Adjustable Positive Depth Stop.
- Dual Purpose Blade Guard for Either-Side Cutting.



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Champion MFG. CO.
2028 WASHINGTON AVE., ST. LOUIS 3, MO., U.S.A.

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Maintenance of Picnic Areas

HUBERT M. HUBBARD
District Supervisor, Maine State Highway Commission

In this district the State now has nine picnic areas to be maintained. They are on route 130, Bristol, with 4 tables; on route 129, South Bristol, with 3 tables; on route 1, Damariscotta, with 4 tables; on route 1, Edgecomb "Davis Island," with 12 tables; on Route 27, Edgecomb, with 3 tables; on route 27, Boothbay, with 2 tables; on route 96, Boothbay "Ocean Point", with 3 tables; on route 144, Westport, with 2 tables; and at the Fire Lookout Station in Jefferson where there are 4 tables.

Before explaining further about picnic areas, let me say that this particular district includes the towns of Alna, Boothbay, Boothbay Harbor, Bristol, Damariscotta, Edgecomb, Jefferson, Muscongus Island Twp., Newcastle, Nobleboro, South Bristol, Southport, Westport, Whitefield and Wiscasset. The State's maintenance work is handled by one patrolman and his helper who have 25.81 miles in the northern part of the district; and by two patrol crews who have the rest of the mileage in the district. Each patrol crew consists of a foreman with a pickup truck, and two 1½ ton trucks, with a varying number of laborers as needed. In dividing up the work, one foreman is responsible for 120.02 miles, and the other has 143.43 miles. With 60 to 70 miles of road for each patrol truck to cover, it was soon determined that there was no time that these crews could devote to maintaining picnic areas, and other arrangements had to be made.

Within Maine's coastal area because of the large number of persons eating lobsters and clams at roadside picnic sites, it was found that the tables had to be cleaned and the waste barrels dumped at least three times each week; and during the last of July and in August four cleanings were required. The State Highway Commission decided to employ an additional man with a pickup truck and helper to service the nine picnic areas and to care for some 16 roadside improvement plots requiring special maintenance. These roadside plots require several mowings, trimmings, clippings and rakings as some of them have shrubs and lawn, while others have only lawns to be mowed. This plan has worked out well, resulting in clean and well-kept picnic areas.

Alum Syrup as a Water Coagulant

After alum syrup had been used as a coagulant at Detroit's Springwells filter plant for a full year, comparison of the alum doses at Springwells and at Water Works Park plant with those of the preceding year indicated that alum syrup is a more efficient coagulant. For the preceding year Water Works Park had an average alum dose of 10.1 ppm and Springwells had 9.5 ppm., a difference of 0.6 ppm. During the last year, Water Works Park had an average alum dose of 10.8 ppm. and Springwells had 9.6 ppm., a difference of 1.2 ppm. A comparison of the average dosage used each month by the two plants shows that the increased efficiency of liquid alum over dry alum occurs mainly during periods of high usage.

Transite Sewer Pipe provides these 4 basic economies

The engineer, the contractor and the taxpayer —all benefit when Transite® Pipe is used for sewer lines. Costs are cut in many ways—among them the four basic Sewer Pipe economies . . . in system design . . . in installation . . . in operation . . . in maintenance. If you make a quick run-through of the following condensed check list, chances are you will find savings which apply directly to your sewer system problems.

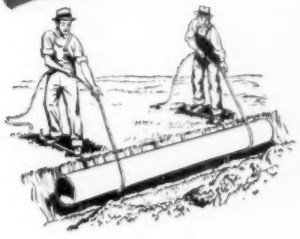
1. System Design

(Typical Economies)

- Installation in shallower trenches
- Savings in amount of material excavated
- Smaller earth loads
- Elimination of cradling
- Location of treatment plant at higher level
- Elimination of pumping
- Use of smaller diameter pipe
- Installation at flatter slopes

Users have found—With its high flow capacity (flow coefficient n= 0.010 derived from the Manning formula) and with its maintained strength, Transite Sewer Pipe contributes to typical system design economies.

2. Installation

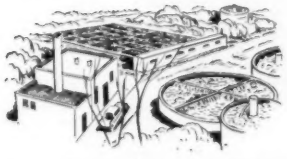


(Typical Economies)

- Fewer joints
- Easier handling
- Smaller crews
- Speedier assembly
- Assurance that joints pass severe infiltration tests

Users have found—With its longer lengths, light weight, ease of assembly and tight, quickly made joints, Transite Sewer Pipe contributes to typical installation economies.

3. Operation

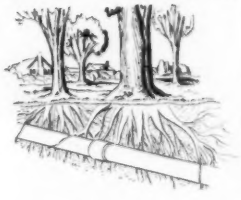


(Typical Economies)

- Infiltration treatment cost drastically reduced
- Only normal sewage treated

Users have found—With its tight joints connected by Johns-Manville's Ring-Tite® Coupling, Transite Sewer Pipe contributes to typical operation economies.

4. Maintenance



(Typical Economies)

- Tree roots kept out—minimizes cleaning
- Sewers kept smooth and intact—pipe stays strong, joints stay resilient
- Need for frequent inspections reduced

Users have found—With its maintained strength and with its tight joints, Transite Sewer Pipe contributes to typical maintenance economies year after year.

For further information and your copy of TR-94A, helpful, widely used Sewer Design Flow Chart based on the Manning Formula, write Johns-Manville, Box 60, New York 16, New York

Johns-Manville TRANSITE SEWER PIPE

the asbestos-cement sewer pipe with the tight joints

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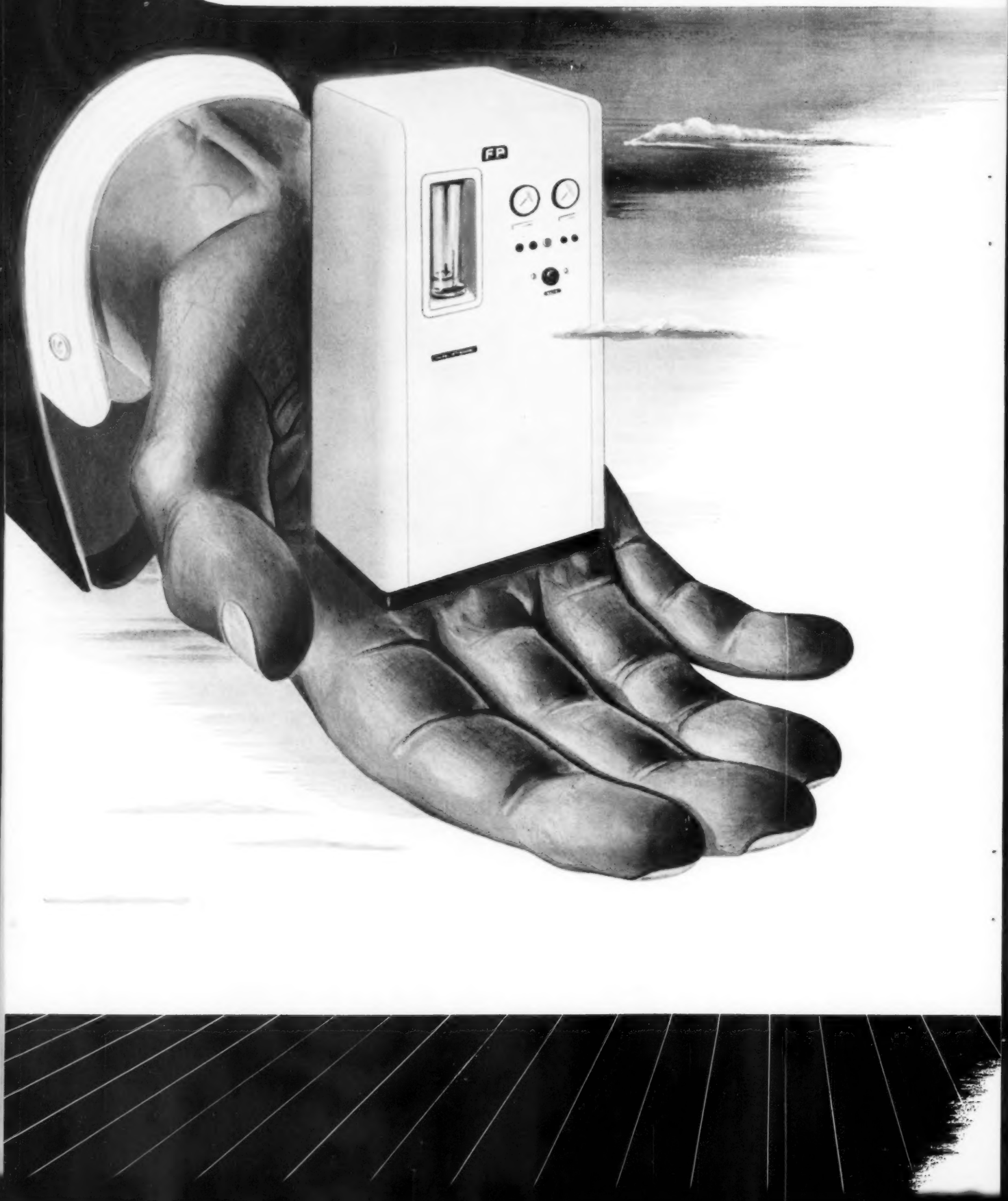
YOU'VE TRIED THE OTHERS AT YOUR EXPENSE
NOW TRY THE F&P CHLORINATOR



. . . AT MY EXPENSE

"Because there are so many good and valid reasons why our Chlorinator merits your deep consideration, I'm signing this advertisement. I am Kermit Fischer, President of Fischer & Porter Company.

Fischer & Porter Company has been in business since 1937, making chlorine control systems for all of the eighteen years since then. In 1949, after years of experimentation and development, we put our first 'packaged unit' chlorinator into service at Winter Park, Florida waterworks — where it has been operating successfully ever since. In May of 1952 we retooled our chlorinator production, incorporating into our basic design all the improvements made possible through the experience gained at Winter Park and some fifty other installations. Now there are more than 1000 of the new model F&P Chlorinators in daily use—and all our customers tell us it is the best chlorinator they have ever used.

HERE ARE SEVEN REASONS WHY I CAN MAKE THIS GUARANTEE OFFER TO YOU WITH CONFIDENCE . . .

1. SAFEST . . . The F&P Chlorinator is completely safe because it uses instantaneously operating mechanical instrument type safety devices. Any malfunctioning shuts off the chlorine supply instantaneously—but the chlorinator automatically starts operating again when the trouble has been corrected. There are no bell jars—exposed or otherwise—with water seals, so there are not the time delays these outmoded components introduce to the safety system.

2. MOST DEPENDABLE . . . Many F&P Chlorinators have operated for over a year at a time without being shut down for any repairs or replacement parts or for cleaning. Even connecting chlorine to the water inlet and water to the chlorine inlet did not faze one customer's chlorinator. After the connections were reversed, the chlorine system sucked itself dry and the chlorinator started up automatically.

3. MUCH LOWER FIRST COST . . . Simplified design, mass production methods, *mechanical* principle of operation, modern instrument engineering, make it possible to supply the new F&P Chlorinator at far lower first cost than the old hydraulic bell jar chlorinators.

4. MUCH LOWER MAINTENANCE COST . . . Not one, not a dozen, but *every* present user of F&P Chlorinators has stated unequivocally that the F&P Chlorinator cuts the maintenance bill to nil—whereas formerly maintenance cost was a major item.

5. NO CORROSION, NO SCRAPING, NO PAINTING . . . Because the cabinet is made entirely of fibre glass—without any internal metal bracing—it cannot corrode, does not have any paint or other finish coat to be renewed. *All* the internal parts are also completely resistant to attack by chlorine, by water or wet mixtures of the two so there is nothing to deteriorate, nothing to scrape, nothing to repair.

6. SIMPLEST TO OPERATE . . . The F&P Chlorinator is so simple that no skill is required either to operate or install. No foundation, no bolting. Just attach piping to the connections labeled 'chlorine,' 'water,' 'drain' and 'vent'—then turn on the chlorine and water valves (either one first) and you're off. Anybody can do it. Anything he does wrong (if he can find something wrong to do) simply shuts down the chlorinator.

7. PROVEN IN USE 1000 TIMES OVER . . . Sales of F&P Chlorinators have increased by leaps and bounds. Over 1000 present users are all saving money day in and day out.

These are provable and proven facts. We can give you every evidence you need of user satisfaction. But I still want you to make up your mind on the F&P Chlorinator, by actual test, *under your own operating conditions.*

All I ask is that you write to me now. Don't wait for repair bills or breakdown to start you thinking about better chlorination equipment. Merely tell me your chlorine capacity requirements, your ejector water supply pressure, your solution discharge pressure and I'll do the rest. You'll be under no obligation whatsoever. I stand on my faith in our Chlorinator. I know that it will win your enthusiastic support, that it will outperform any other chlorinator ever offered. All I ask is that you convince yourself—by trying it at no cost to you.

Will you write to me today—and ask me to prove what I say—*right in your own plant*—under your own operating conditions?"

Kermit Fischer

President.

complete process instrumentation

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565 Fischer Road, Hatboro, Penna.

18 YRS. EXPERIENCE SUCCESSFULLY MANUFACTURING CHLORINE FLOW METERING EQUIPMENT

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WEED PROBLEMS?

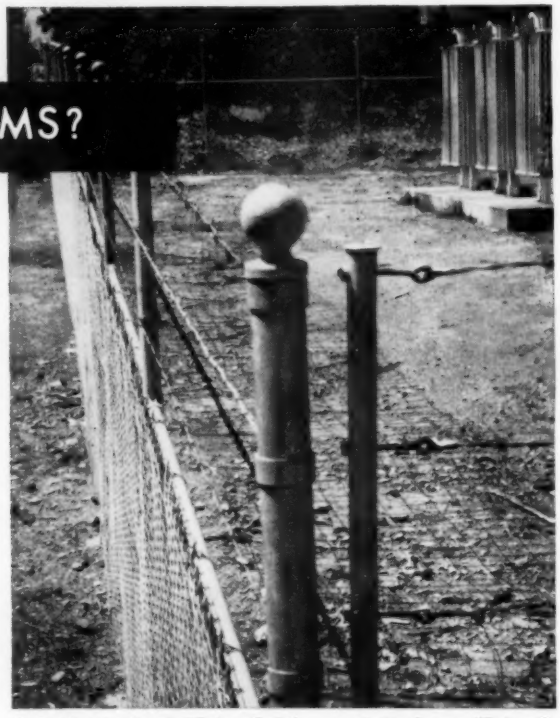
One application of

Du Pont Telvar®

WEED KILLERS

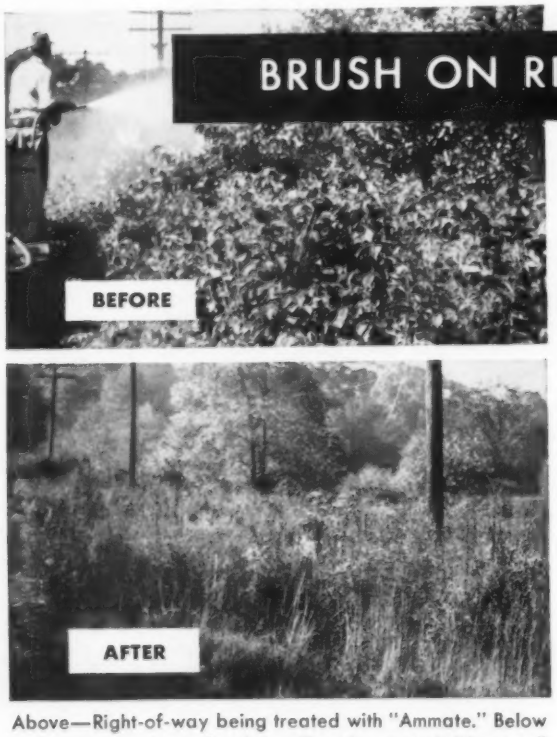
stops weeds for the season—or longer!

"Telvar" kills weeds through the roots . . . prevents regrowth. Low rates (20 to 80 lbs. per acre) make it cost little for the results you obtain . . . also mean less handling, fewer storage problems. To cut maintenance costs to new low levels, put "Telvar" in your weed-control program. Available in two formulations: "Telvar" W, and "Telvar" DW.



Note thorough job "Telvar" did around this fence. "Telvar" won't corrode fence or equipment, it's low in toxicity to humans and animals, non-flammable and non-volatile.

BRUSH ON RIGHT-OF-WAY?



Above—Right-of-way being treated with "Ammate." Below—Three years later, brush is still under control. "Ammate" allows low-growing cover to return to resist erosion.

One application of

Du Pont Ammate®

WEED AND BRUSH KILLER

kills more kinds of brush —safely—at lower cost!

"Ammate" kills more kinds of brush and keeps it down longer than most weed and brush killers! When the original spray job is done well, brush is kept under control for years with only an occasional spot spray. You can rely on "Ammate" to do the job safely, even where your right-of-way adjoins cropland, because "Ammate" is not volatile. There are no vapors to drift onto sensitive crops. It is no hazard to crews, stock or wildlife.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. For your copies, write to Du Pont, Grasselli Chemicals Dept., Rm. 4032, Wilmington, Del. In Canada, Du Pont Company of Canada Limited, Box 660, Montreal.

On all chemicals always follow directions for application. Where warning or caution statements on use of product are given, read them carefully.

Telvar® Weed Killers for industrial use

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Ammate® Weed and Brush Killer

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Agile Oliver Hydro-Trencher digs 12-feet with ½-yd. bucket!

You can easily drive this compact, one-man trencher into spots where truck or crawler mounted units are helpless. Yet the Oliver 88WT is no small trencher. Its half-yard bucket digs to 12 feet and loads to 9½ feet. If you need more loading height, add the special hydraulic-trip loading bucket and dump at 12 feet.

The Hydro-Trencher has unmatched power and control for more profit in any digging. Two separate hydraulic circuits *keep* pressure on every move, even when you perform two operations at once. Dual controls provide speed and power variations for slicing through roots, rocky soil, hard clay, or delicately digging around pipes or foundations.

Wide bucket rotation permits fast dumping and high loading without spillage. Dirt or rocks can be clamped against the dipper stick and held at the highest level. Another thing—the trencher converts to a swing loader by simply turning the bucket around. The hydraulic stabilizer blade does two jobs, too. It holds the tractor level and steady, and doubles as a backfiller blade.

See this trencher in action. Test it yourself. Visit your Oliver Industrial Distributor. The 88WT Hydro-Trencher is available in either gas or diesel models. See it soon!

THE OLIVER CORPORATION
400 W. Madison Street, Chicago 6, Illinois

A complete line of industrial wheel and crawler tractors

This is the Oliver "OC-3" crawler with backhoe attachment. All-weather crawler traction makes the "OC-3" a handy unit for a multitude of trenching tasks. The "OC-3" takes bulldozers, front-end loaders and many other attachments, too.

Another Oliver handy for trenching is the multi-purpose Super 55. Built-in hydraulics on this tractor operate a variety of front-, side- and rear-mounted equipment. The Super 55 is available with gas or diesel engine.

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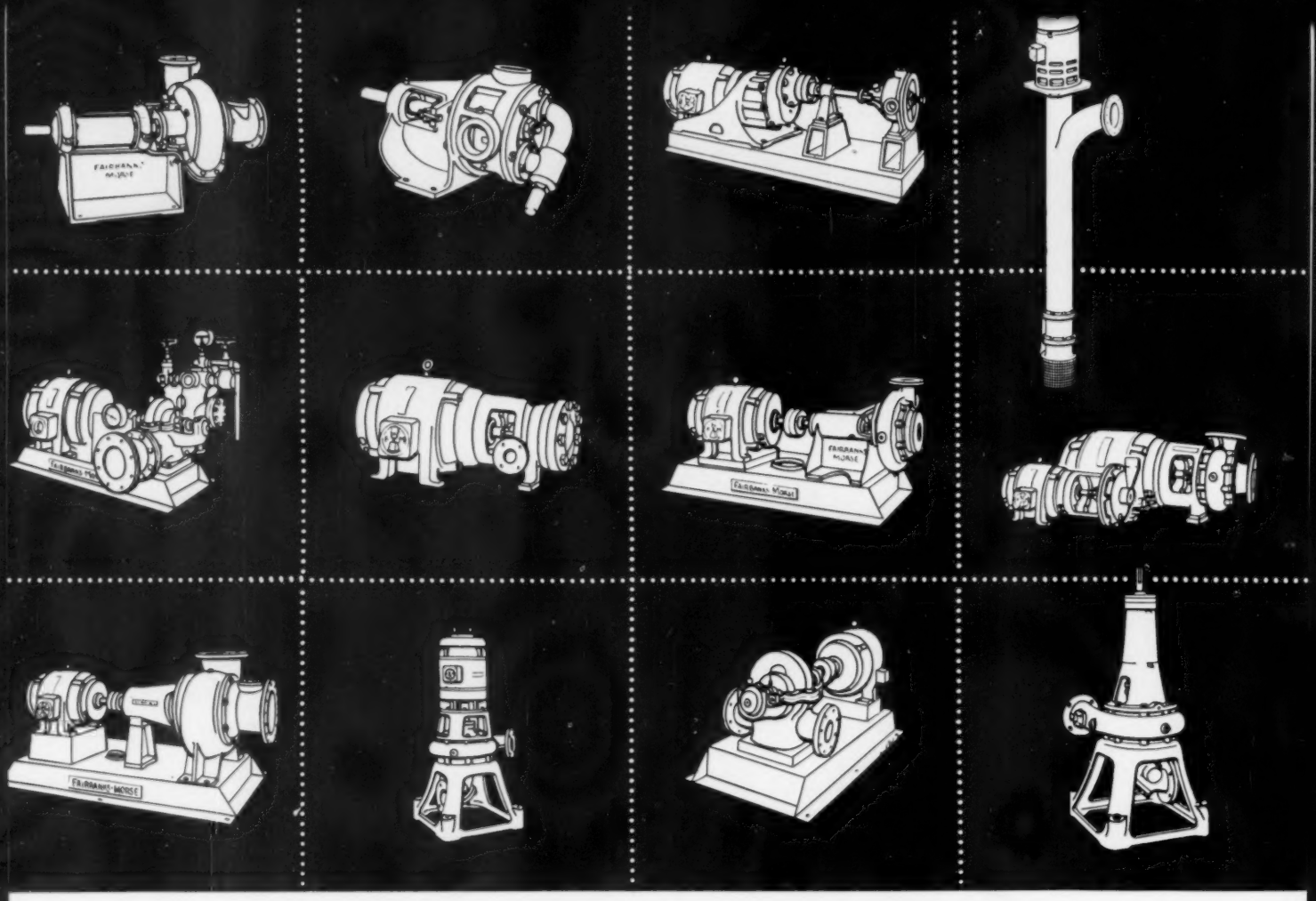

YOU CAN RELY ON YOUR F-M PUMP ENGINEER...

to solve any pump problems!

Troubled by a pumping problem? There's an easy solution. Call your Fairbanks-Morse Field Engineer. His business is solving your problems . . . selection and applying pumps that will answer your needs most economically and efficiently.

Because Fairbanks-Morse is the world's largest manufacturer of a complete pump line, your Fairbanks-Morse Field Engineer is not handicapped in his recommendations. He can select the pumps that offer you the most for your pump dollar. He has the field experience and is backed by the most experienced pump engineering department in the business. To solve your pump problems, call your Fairbanks-Morse Field Engineer. Fairbanks, Morse & Co., Pump Division, 3601 Kansas Ave., Kansas City, Kansas.

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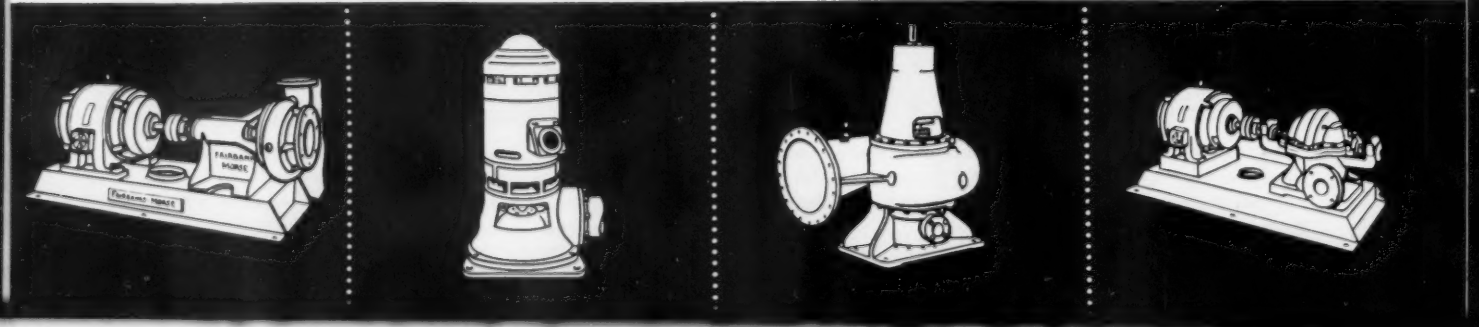

simply · effectively · economically

CALGON* stabilizes iron and manganese dissolved in water, prevents iron pickup from pipes, Calgon is easy to use—stops Red Water effectively and *economically*.

Tuberculation in mains can lead to costly cleaning, and leave permanent damage difficult to repair. Corrosion control† with Calgon reduces tuberculation to a minimum, keeps flows high, and lowers pumping costs. Many communities using Calgon have found that power savings alone have exceeded chemical costs.

Calgon stops lime scale by forcing calcium carbonate and other scale forming chemicals to stay in solution, even when the water is heated. Calgon treatment to prevent lime scale is economical since Calgon is used in threshold amounts, and the reduction of lime scale means important savings in keeping equipment and meters clean.

Call on Calgon for the solution to your specific problem. Many years of experience with water problems of all kinds in every part of the country are at your service.

*Calgon is the Registered Trade Mark of Calgon, Inc. for its glassy phosphate (sodium hexametaphosphate) products.

†Fully licensed for use under U. S. Patent 2,337,856 and 2,304,850.

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HAGAN HALL BUROMIN CALGON

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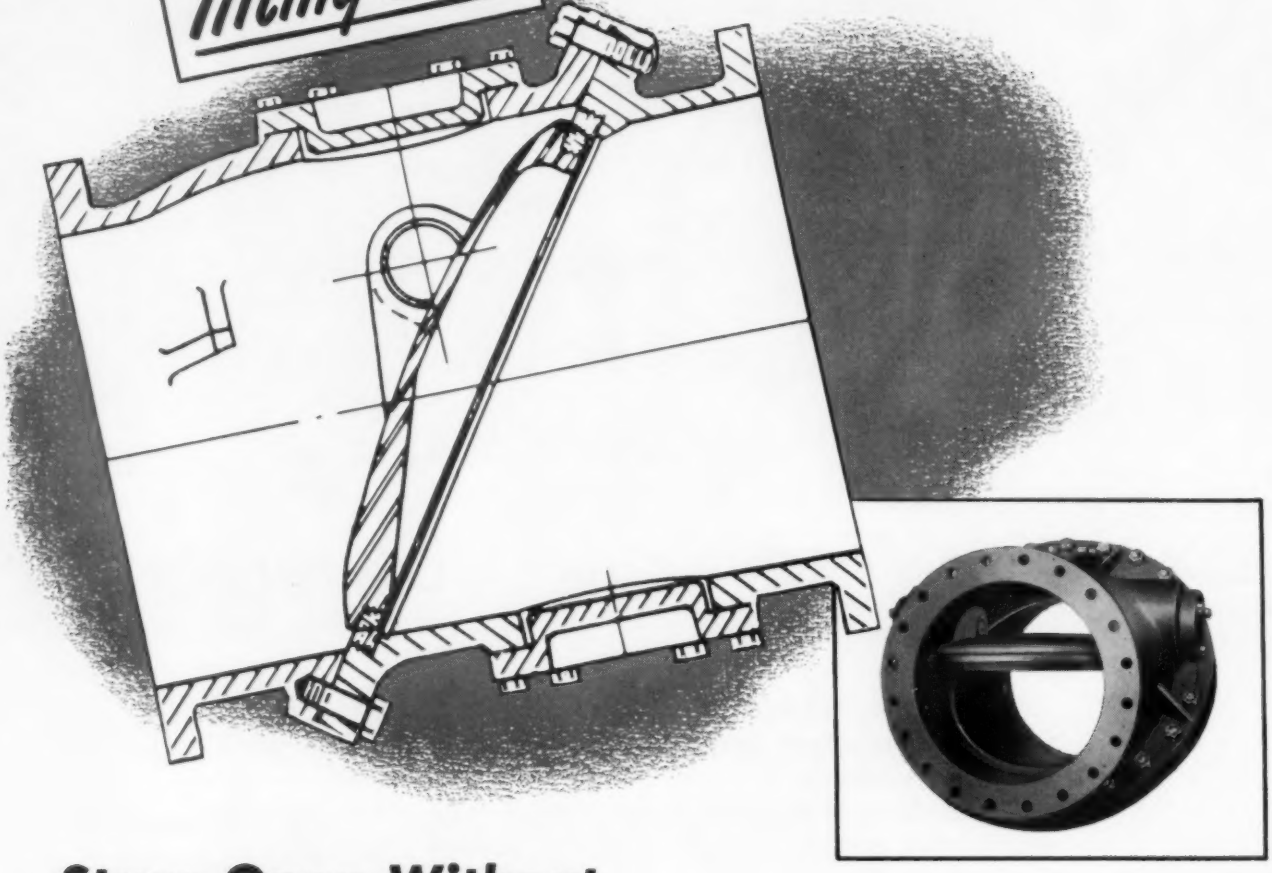
CHAPMAN'S

Tilting Disc CHECK VALVE



Stays Open Without Flutter, Closes Fast Without Slamming

Chapman's Tilting Disc check valve keeps maintenance costs down in the entire piping system. There's no flutter or vibration in the open position: the lightweight, airfoil-designed disc is held firmly against its stops by the fluid flow.

When flow starts to reverse, the uniquely designed disc swings quickly to the closed position, cushioned by fluid pressures, and then drops to a tight seal against the seat, without sliding or scraping. Closure is fast, tight . . . and *quiet*. Slamming is *eliminated*, in all but unusual piping arrangements.

Freedom from vibration and slamming, low wear and low head loss keep maintenance costs down, give years of more efficient service. For every check valve service, specify Chapman's Tilting Disc. Available in steel or iron, with suitable trim to meet service conditions. Full engineering data are in Catalog 30. Write for it today.

The Chapman Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS

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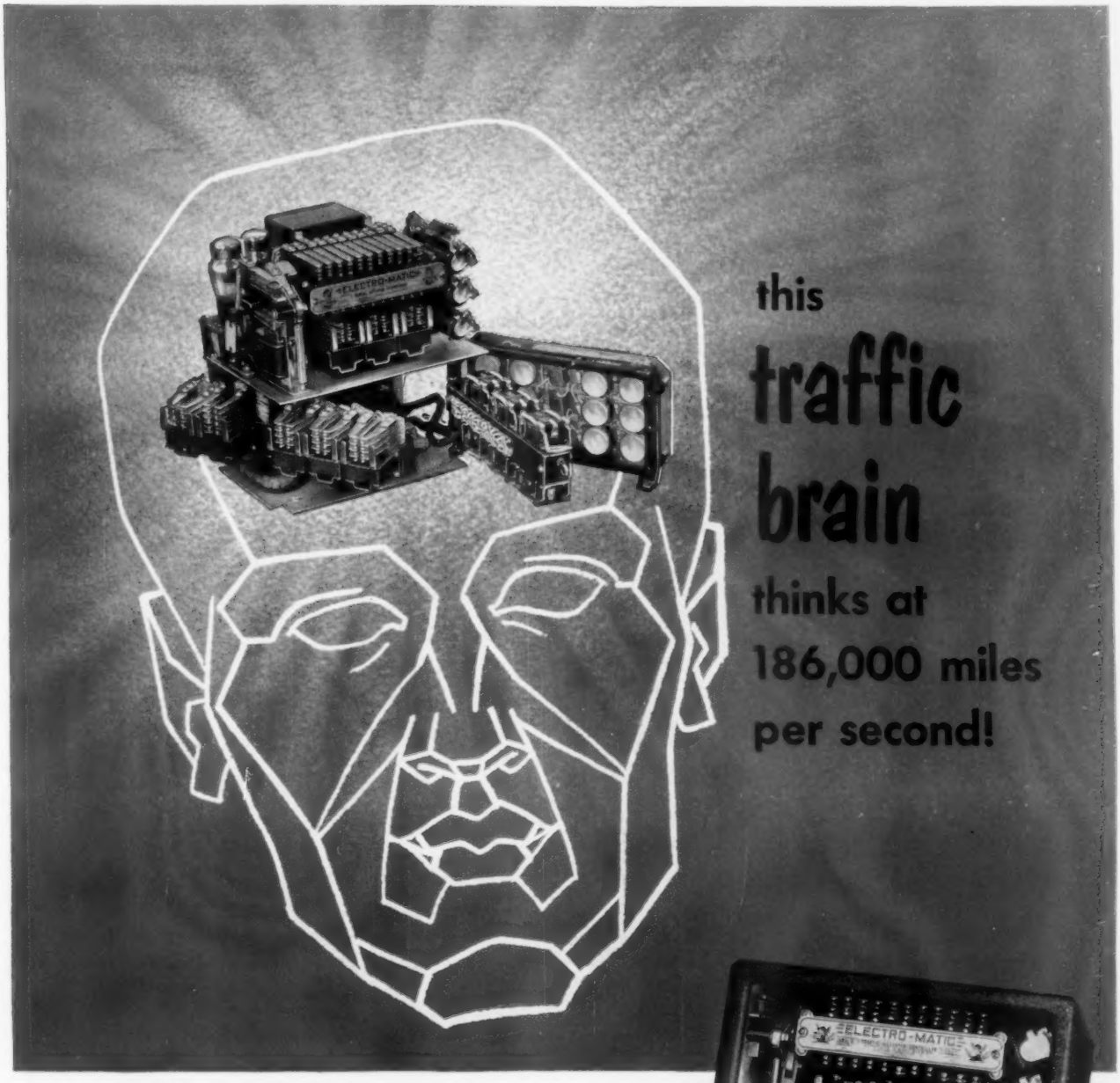
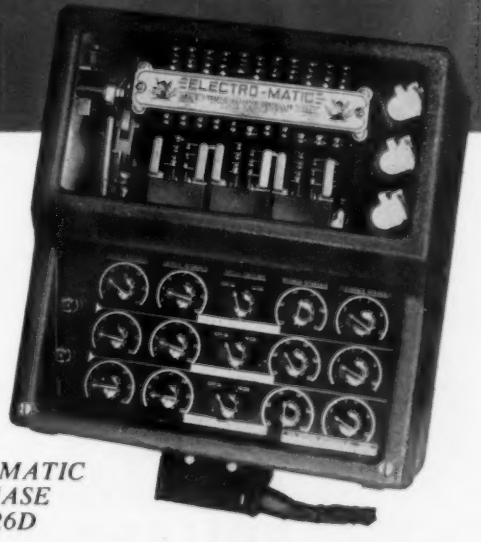


Traffic signal controls tend to encourage violation and create delay if they do not respond to immediate demands of traffic.

Electro-Matic Controllers, with modern *electronic brain* features, move traffic through intersections more efficiently and safely than by *any other method.*

For details, write for catalog, or request analysis of your special traffic problems.



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THREE-PHASE
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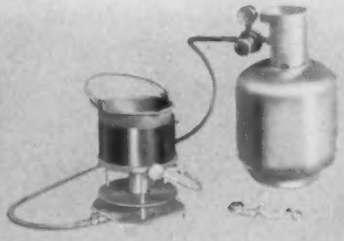
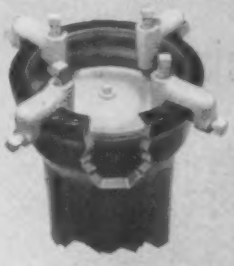


MELTING FURNACES

M-SCOPE PIPE FINDER



TEST PLUGS

MANHOLE CUSHION

SEWER CONNECTIONS

FOR TOP QUALITY PIPE LINE EQUIPMENT

CHECK POLLARD

For complete, modern pipe line equipment to meet virtually all your needs, be sure to call on Pollard! *More than a century of service and experience are behind each of the one-hundred-twenty-six equipment categories listed in the new Pollard Catalog.*

Hundreds of Pollard customers depend on Pollard for prompt delivery of highest quality pipeline equipment, backed by the most cooperative service in the industry.

PLACE YOUR NEXT ORDER WITH POLLARD. Look up the Pollard Catalog, or write for a new copy. Ask for Catalog 26.

PIPE LINE EQUIPMENT
PIPE LINE EQUIPMENT
JOSEPH G. POLLARD CO., INC.
PIPE LINE EQUIPMENT
PIPE LINE EQUIPMENT

If it's from POLLARD . . . It's the Best in Pipe Line Equipment

NEW HYDE PARK • NEW YORK

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Alcoa® Aluminum Spells Economy on 2,442 New Ohio Turnpike Signs

Engineers who designed Ohio's new 241-mile turnpike kept an eye on economy as well as safety. They specified aluminum for 2,442 signs that direct and regulate traffic and thereby launched a stream of economies that will continue for years to come.

Right from the start, aluminum's ease of fabrication effected notable savings in manufacture. Its light weight kept shipping costs low and facilitated handling and erection. And its high strength—a match for wind loading in excess of 100 miles per hour, even on 10-by-20-foot signs—is insurance against storm damage.

But it's the corrosion resistance of Alcoa Aluminum alloys that will pile up the greatest savings. Even when vandalism or accidental impact breaks the message film, there will be no progressive corrosion or red rust to destroy utility. Signs stay on the job no matter how long repairs are delayed. Maintenance costs are sharply reduced.

In 28 states and many counties and cities, aluminum has already won acceptance as a standard material for painted, enameled and reflectorized signs. Alcoa sales engineers, backed by 67 years of experience in development of superior alloys and solving customers' problems, can help you gain the same advantages that account for this widespread endorsement. Call your local Alcoa sales office for details, or use the coupon below.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

ALUMINUM COMPANY OF AMERICA
1978-F ALCOA BLDG., PITTSBURGH 19, PA.

Please send me information on Alcoa Aluminum Highway Signs.

Name_____

Title_____

Street Address_____

City_____ Zone_____ State_____

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Get full details of this month's products . . . mail your Readers' Service card today.

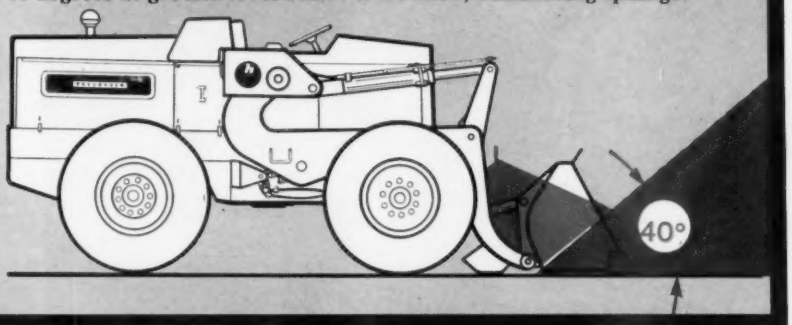
only these 2 completely different

PAYLOADER® TRACTOR-SHOVELS

offer you all these features...

40 DEGREES BREAKOUT AT GROUND LEVEL

You can get HEAPED BUCKET LOADS and you get them FASTER and EASIER WITH THIS NEW BUCKET ACTION. Most important of all—you KEEP BIGGER PAYLOADS—because the bucket can be tipped back a full 40 degrees at ground level before it is raised, eliminating spillage.



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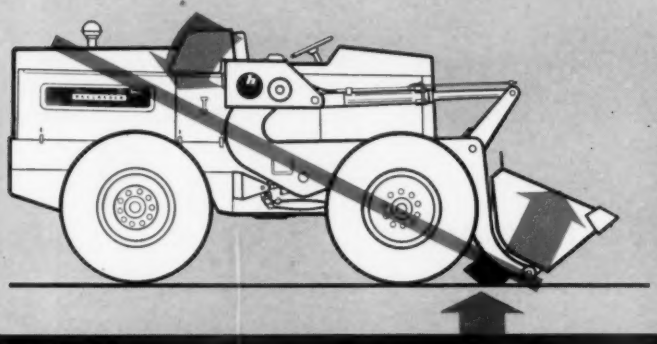

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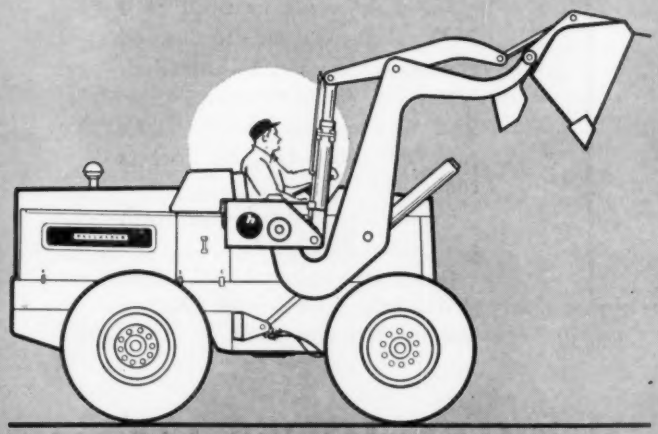

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Fullest operator visibility for safe, fast maneuvering; power-steering; minimum number of control levers. Foam-rubber molded seat and back cushions. Seat adjustable for operator comfort. Longer wheelbase and better balance add to riding comfort.

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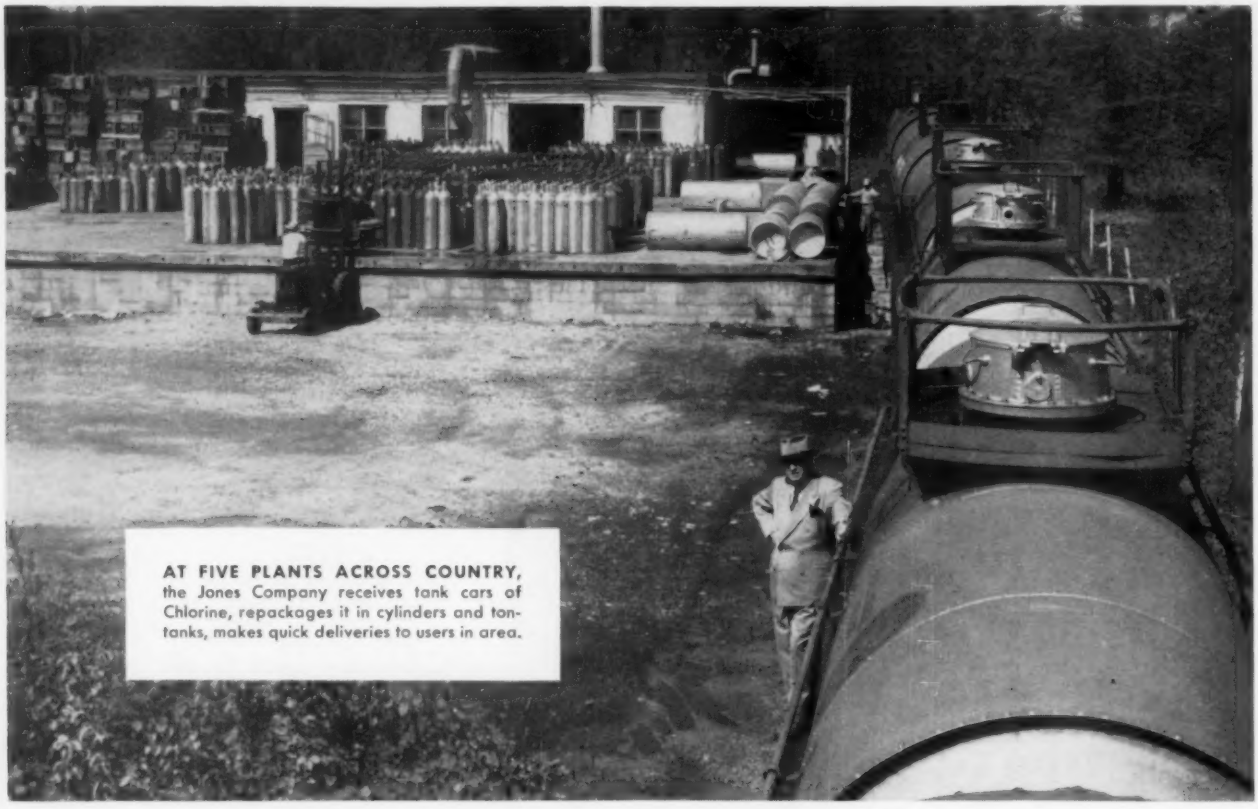
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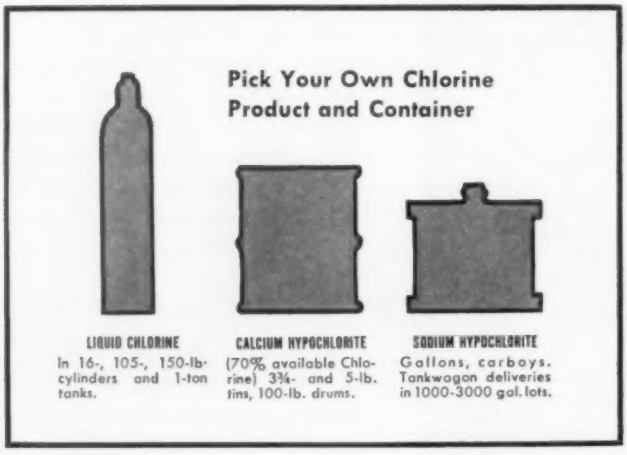
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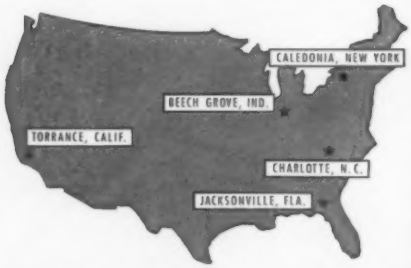

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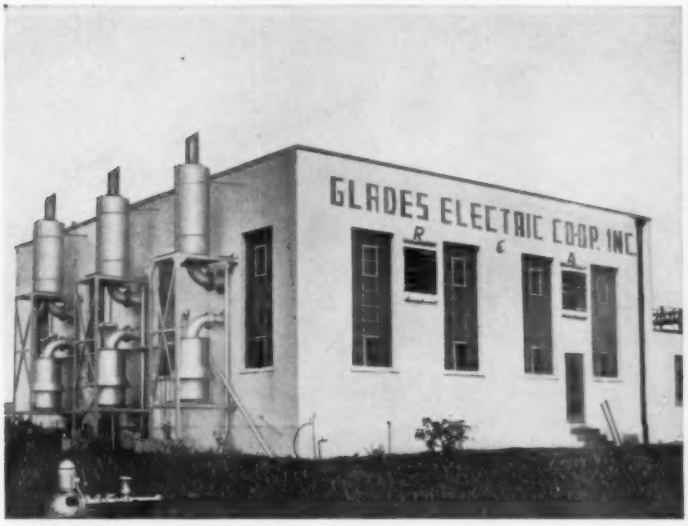

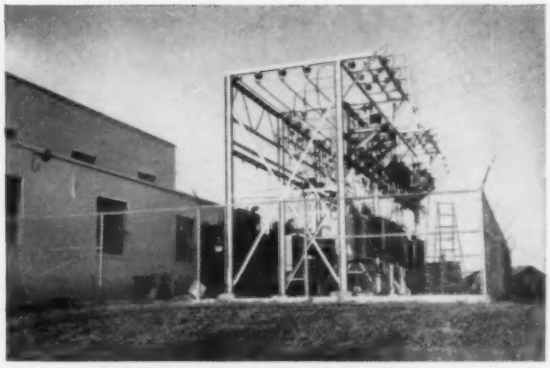

2500 KW Enterprise-powered REA Co-op serves homes, business, industry and agriculture in broad area up to 450 miles distant. New plant has never had a power failure.

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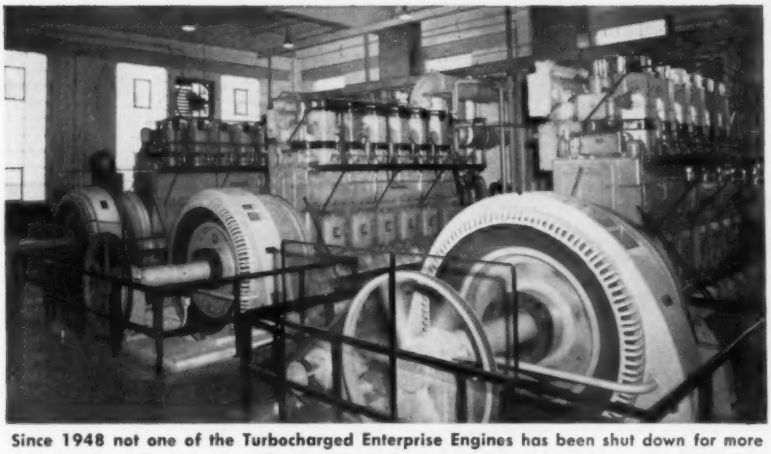
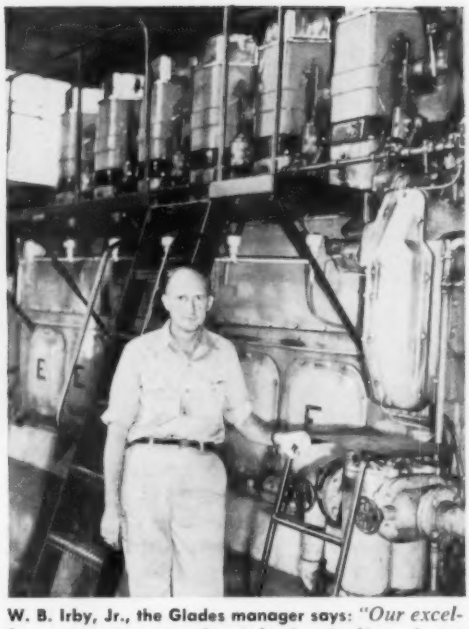
REA Co-op proves Enterprise dependability —no power failures here!



Since 1948 not one of the Turbocharged Enterprise Engines has been shut down for more than two hours for minor repairs or adjustment—even when operating at peak load of at least 20 out of 24 hours, six months at a time.



W. B. Irby, Jr., the Glades manager says: *"Our excellent operating record speaks for itself, and certainly speaks well for both my Superintendent, Mr. Keenan, and Enterprise Engine & Machinery Co. If we have our choice, we will never have anyhing in our plant but an Enterprise."*

If power failed at Moore Haven, located in the heart of Florida's hurricane belt, untold loss of life and property could result. That's why Glades Electric Co-op, Inc. installed two heavy-duty Enterprise Engines when it repowered its plant in 1948.

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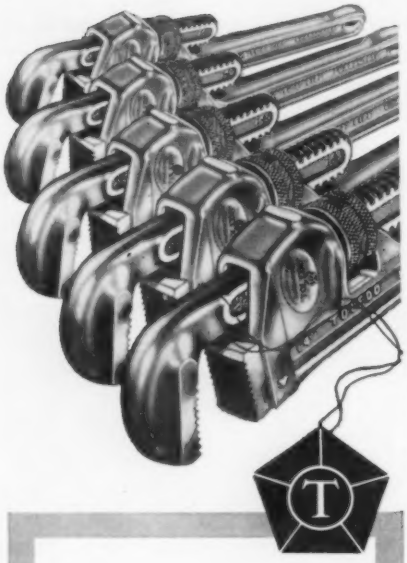

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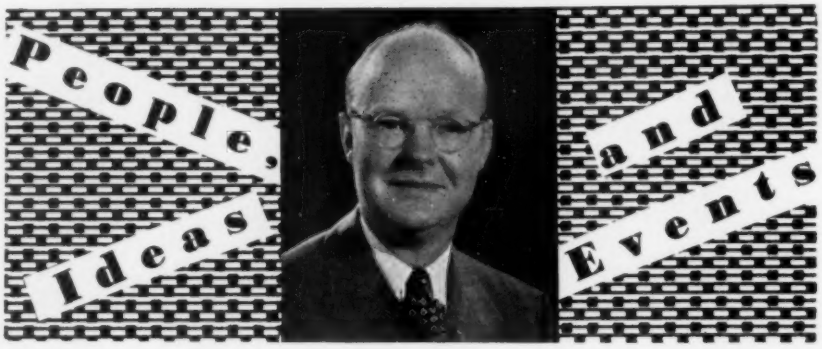


by "Doc" Symons

H.T.M.A. — And this is the month —June, when brides are more numerous, when days are longer, when sprinkling becomes important to water works men and when the water works clan gathers in Chicago.

★ ★ ★

Chicago — what memories it holds for me: my first AWWA convention in 1933 and the Century of Progress Fair where I first met Col. T. A. Wiggin, a consultant of note in the water works business—The meetings of the Illinois Section of AWWA and the time I watched Lou Birdsall of General Chemical Co., listen open mouthed as he heard the Fuller Award being made to him.—The meetings of the WPA (Water Works Peddlers Assn.) which I had the privilege of attending several times—The experimental filter plant of John Baylis where history was made with activated silica, coagulation, and taste and odor control—The new South Side Filtration plant and its acres of filters—The long hours and late nights I spent in a print shop proofing and okaying pages for a magazine—A number of restaurants where I've had fine and unusual food—The AWWA convention of six years ago when the Society of Council Bluffers held its first meeting in commemoration of our trip to the San Francisco convention of '47, and when I first learned of a game called Honest John. Yes, the AWWA convention in Chicago in 1949—Was it six years ago? It was ages—it was only yesterday!—And now this month we'll be there again. I'm looking forward to it.

★ ★ ★

Congratulations — or you only reach 50 once—Through the kindness of Harvey Howe, Vice Pres. of Lock Joint Pipe Co., I was privileged to receive one of that company's medallions struck to commemorate the 50th anniversary since the company was founded by the late Allan M. Hirsch.

The obverse of the medallion, (that's the reverse of the reverse) pictures the installation of the largest pipe ever produced by the Company—a 150-in. diameter pressure pipe for the Boston aqueduct.

★ ★ ★

Swedefinition — "Experience is that thing which causes a man to make new mistakes instead of repeating the old ones.

★ ★ ★

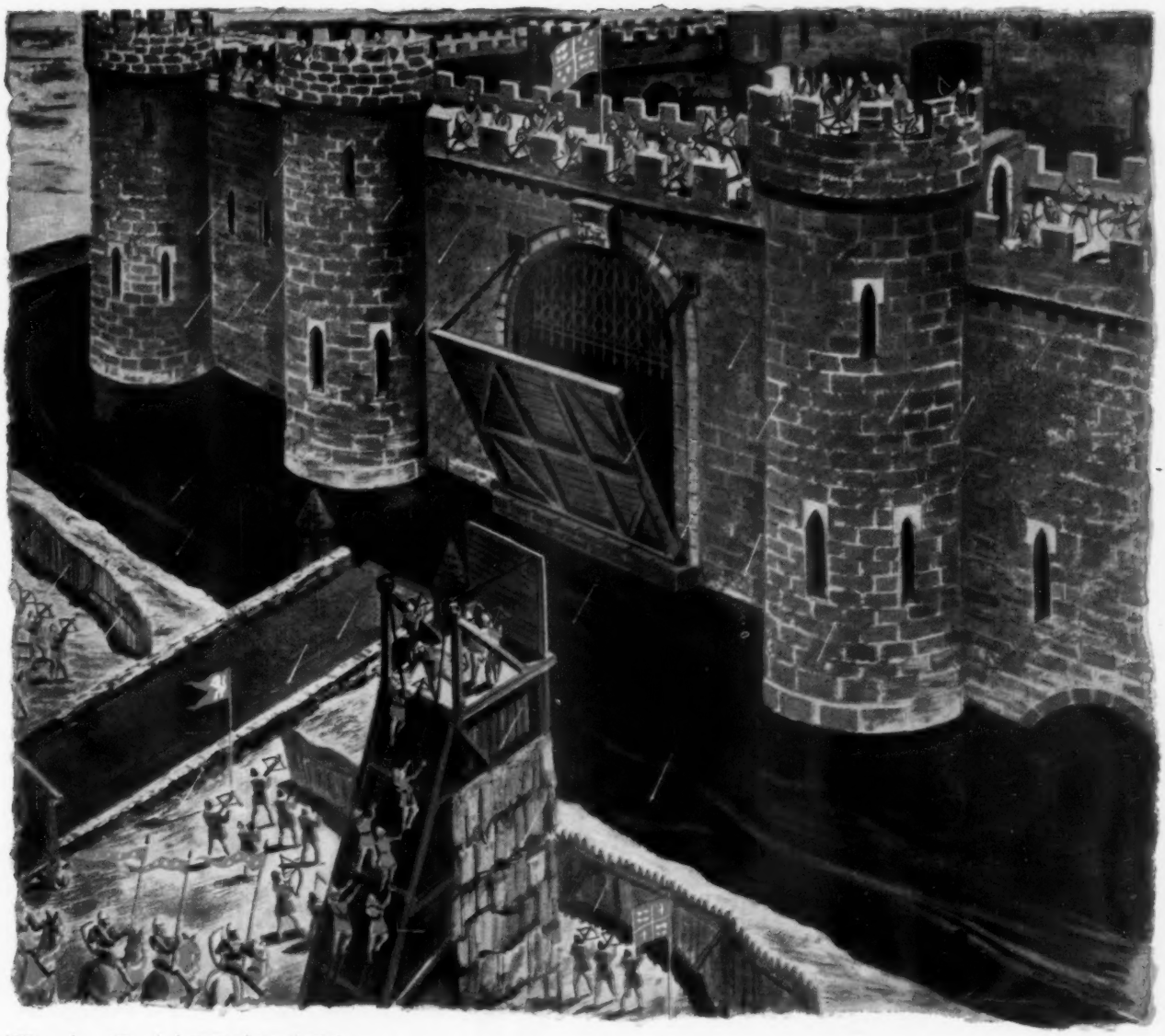
Bombshell — or shall we choose up sides again?—There's nothing like a controversial subject to stir up the buzzing in the halls around a convention. The meeting of the N. Y. Section of the AWWA in Buffalo was no exception.

To look at Ben Nesin, Director of Laboratories of the Dept. of Water Supply, Gas and Electricity, City of New York, you wouldn't suspect that he could stir up storm in the water works industry and in the field of medicine and dentistry as well—But Ben's comments at Buffalo will undoubtedly do the trick.

Unheralded, and unannounced on the program, Ben spoke off the cuff at the Round Table session and quietly summarized a report he has prepared on the toxicological implications of the fluoridation of water supplies.

Mr. Nesin, who is a thorough student and a diligent worker, had carefully documented his report with references to many articles and workers in the field of medicine, dentistry and toxicology.

The report has not been made public as this is written; it may be published in some medical journal; it may not appear in the AWWA Jour. since the paper was not read as a scheduled part of the program, so I can't tell you where to



WATER... guardian of the city

From earliest times, mankind has recognized water as the guardian of its safety. The medieval castle relied on its water-filled moat to discourage attack. Today, water is still man's first line of defense against disease and fire.

The vital pipelines which form this first line of defense are the prime concern of farsighted water works officials. More and more of them are turning to LOCK JOINT CONCRETE PRESSURE PIPE on the basis of time-tested performance. The danger of crippling the city's water supply and sanitary facilities through burst or ruptured pipe does not exist in Lock Joint pipelines. The pipe's initial high carrying capacity is permanent, assuring ample water and pressure to combat the hazards of fire.

With Lock Joint you can benefit from these advantages in a virtually ageless pipeline which will require very little, if any, maintenance.

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Locating these leaks with Simplex Pitot Equipment costs only a tiny fraction of the value of the water being wasted. You get accurate flow records with minimum effort . . . valuable data that will help you to reduce "unaccounted-for water" to a minimum.

PITOT ROD

Simple, rugged and lightweight. Easily installed on any pipe or main. Special clamp holds tube firmly in position against water pressure.

Low coefficient gives high differential pressure for greatest accuracy.

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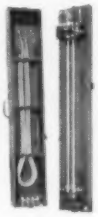

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Can be used for wide flow ranges . . . low or high.

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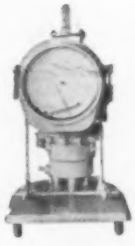

Connects easily to Pitot Rod. Eight-inch chart records flow data. Simple and rugged construction . . . no delicate mechanisms . . . yet sensitive and accurate.

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look for it, but briefly here are some of the points made in Mr. Nesin's comments.

The fluoride ion is a poison, toxic to human beings.—The fluoride ion is a cumulative poison in human beings.—There exist ample data in the literature to show that even in concentrations of 1 ppm, fluorides are stored in the body and tend toward the hazardous level.—Some of the data adverse to the fluoridation of water supplies has been rejected for publication by scientific journals in this country.—The A. M. A. and the A. D. A. have endorsed fluoridation without fully studying or understanding the toxicological implications.—There have been a number of authenticated cases of fluoride poisoning in the U. S. (one in Newburgh, N. Y. where the first 10 yr. fluoridation experiment has just been completed) but these cases have not been publicized.—The data on the percent reduction of dental caries as indicated by results in several cities, where 10-year experiments are under way, are misleading and misinterpreted as to their true implications and in some cases are actually based on improper observations.

The data issued by the Public Health Service showing no epidemiological effects in waters containing naturally occurring fluorides, when compared to fluoride free waters have not been interpreted correctly. —In view of the small amount of water actually consumed, it is a costly and wasteful practice to add fluorides to water supplies, especially to "treat" only a fraction of the population (children under 8 years old). The use of fluoride tablets in a safe procedure would cost about 1/6 of water supply fluoridation and would "treat" the selected group to be benefited, under their own decision rather than imposing fluoride intake on everybody, forever.—It is incorrect to base the evaluation of dental caries efficiency on 10-year olds when the dental caries hypothesis is premised on findings in the 12 and 14-year old groups. In short, 10-year evaluation experiments do not give the real answer sought.

And lastly, all these things being true, the water works man owes it to his community and to his profession to consider the toxicological implications of fluoridation and to oppose it openly since it is not a method of water treatment but infringes on the realm of preventive medicine.

★ ★ ★

Well, you can guess that these comments left the audience a bit

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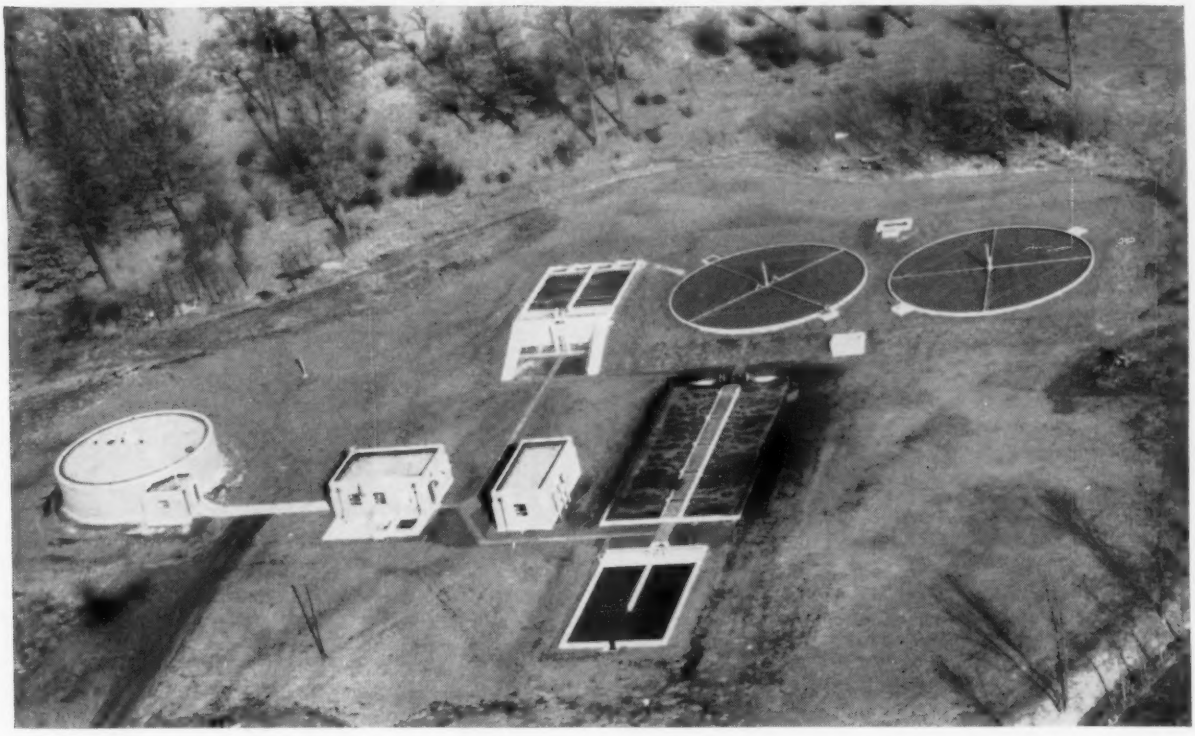
Lower left, 50′ digester with PFT Floating Cover. Top right, 2 circular filter beds with PFT Rotary Distributors



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In 1952, Orrville expanded its sewage treatment facilities by adding a new trickling filter plant to provide complete treatment for a design population of 15,000. Continuing an association that dates back to 1908, PFT again supplied Orrville with highly developed equipment for effective waste treatment.

A *PFT Rotary Distributor* is installed in each of the two 68′ circular filter beds. These units are ruggedly constructed for long, dependable service. Specially designed spreader jets provide uniform distribution over the entire filter bed area, assuring the most effective treatment.

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PFT Floating Cover for the 50′ digester to provide positive scum submergence and flexible operation.

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PFT Waste Gas Burner to burn off excess gas safely and avoid odor nuisance.

PFT Gas Safety Equipment for maximum protection against fires and explosions.

In keeping with its policy, PFT assisted Orrville's consulting engineers by showing the adaptability of its equipment in meeting specific plant requirements.

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Saves space. Even these high pressure valves are compact, easy to install, and require little head room. Available from 10" to 72" diameter in either cast iron or fabricated steel. A variety of operator types can be supplied.

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stunned, perplexed, disturbed and confused. And that may be the attitude of water works men throughout the country.

In commenting on Mr. Nesin's remarks, I pointed out that tea contains large amounts of fluorides, as do vegetables grown in high fluoride soils, and as do many water supplies consumed over many years by several million persons. I raised the question: If Mr. Nesin's statements are true, what about those of us who drink tea, eat vegetables containing fluorides, or drink water with naturally occurring fluorides. Should we begin to worry about the state of our present or future health?

Mr. Nesin says yes, "where fluoride ingestion takes place from any source, that ingestion may tend to be hazardous. Absorption and retention depend on the company kept by the fluoride ion; in this respect, the composition of water supply, character of diet and exposure to intake from other sources are determining factors, as are the matter of individual susceptibility and state of health of the individual. The problem cannot be over simplified."

★ ★ ★

Tom Riddick, Cons. Engr. and Chemist of New York City, added fuel to the fire when he quoted a letter he had written to a client, "Charlie" Horsfall, Supt. of the Ossining, N. Y. Water Department. Tom expressed grave doubts as to the expediency of fluoridation at this time without a further fact-finding study.

Mr. Riddick stated that "since fluoridation of water supplies was aimed at bringing about a physiological effect, the AWWA should use its good offices to bring into the picture the Rockefeller or Carnegie Foundation, or some similar well qualified and impartial group of scientists who have competent physiologists. And that an extensive fact-finding survey, should be made by such an organization, rather than review of existing literature. Engineers and chemists engaged in water supply are not competent physiologists and they are not qualified to pass on matters involving physiology."

Mr. Riddick also expressed the opinion that favorable attitudes of many State Boards of Health towards fluoridation were due at least in part to the fact that they are pretty heavily subsidized by the U. S. Public Health Service, who are and have been the chief propo-

(*Continued on page* 178)

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Triangle Brand Copper Sulphate economically controls microscopic organisms in water supply systems. These organisms can be eliminated by treatment of copper sulphate to the surface. Triangle Brand Copper Sulphate is made in large and small crystals for the water treatment field.

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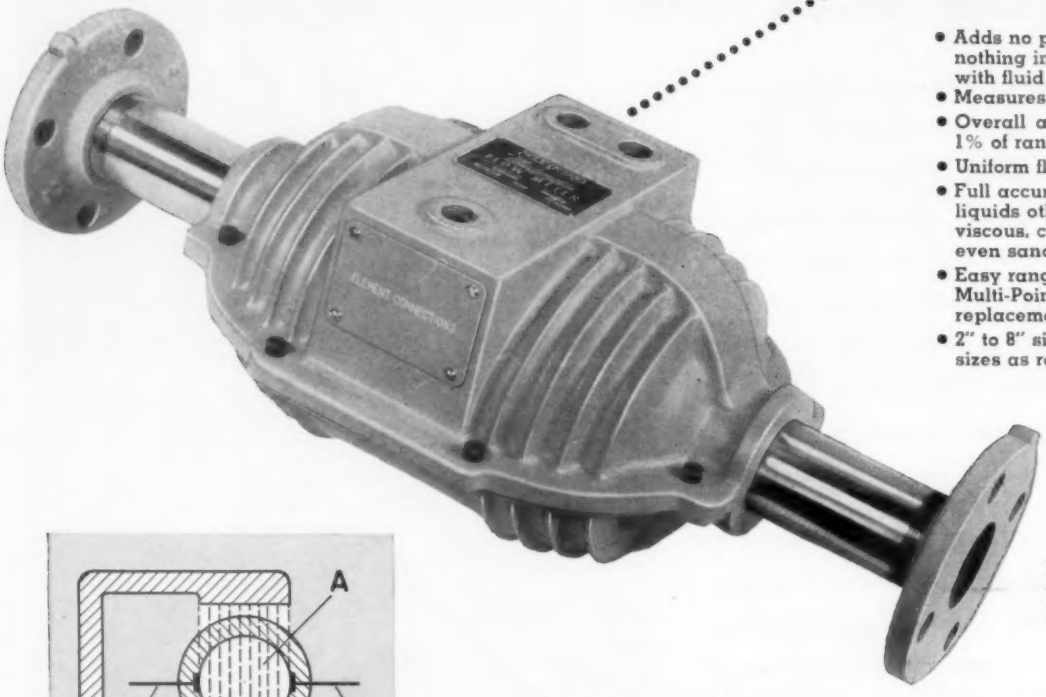

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- Easy range change — either by Multi-Point Switch or range coil replacement, as preferred.
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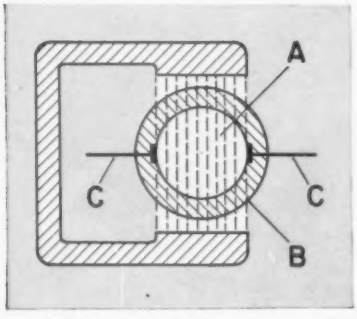


SIMPLE, TROUBLEFREE, OPERATION

The Foxboro Magnetic Flow Meter operates on the same principle as a power generator. A magnetic field (A) is maintained through a standard pipe section (B) of stainless steel or other non-magnetic material. This pipe section is lined with Kel-F® or other insulating material. Liquid passing through pipe acts as moving conductor, generating an electric voltage which varies in proportion to liquid's average velocity. Flush electrodes (C) in pipe wall "pick up" this voltage which is recorded in desired flow units by Dynalog Electronic Recorder or Controller.

This premium-performance meter measures *magnetically* the flow rate of virtually any liquid except hydrocarbons. It completely ignores such common metering headaches as turbulence, suspended solids, and variations in conductivity, density, and viscosity. It even measures reversing flows.

Installation is simple. The magnetic spool piece connects into the line like any equivalent length of pipe — no seals, purges, meter runs, or straightening vanes required. Connects by 2-conductor cable to remote Dynalog Electronic Flow Recorder.

Maintenance is practically eliminated. There are no pressure taps to become plugged or frozen, no working parts to foul.

Foxboro Magnetic Flow Meters are already in use on such widely different liquids as beer, sand-and-water, rosin size, rock-and-acid slurry, viscose, and highly corrosive liquid detergent. Find out how this precise, troublefree flow meter can help *your* processing. Write for complete details.

THE FOXBORO COMPANY, 266 NORFOLK STREET, FOXBORO, MASS., U. S. A.

FOXBORO
REG. U. S. PAT. OFF.

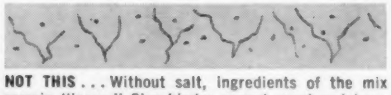
Foremost in FLOW METERING

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

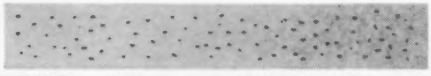
Thousands use our Readers' Service card to keep up to date . . . do you?

3 BASIC REASONS WHY
STERLING ROCK SALT STABILIZED ROADS
Wear Better, Longer . . . with Less Maintenance!

1. Greater Compaction Means Greater Density!

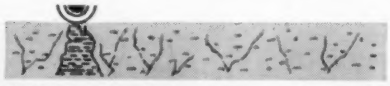


NOT THIS . . . Without salt, ingredients of the mix remain "loose." Clay binder cannot repel moisture. Excess rain makes rivulets. Dried out, they leave weakening crevices.



BUT THIS . . . With salt, you get better compaction. Brine film is thinner than water, allowing tighter bond of the whole mix. Clay, with brine, repels excess rain at surface. No rivulets. No weakening crevices.

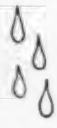
2. Greater Load Transference Means Longer Road Life!



NOT THIS . . . Unsalted road. Wheel of loaded truck puts a great weight on one point of surface. Roadbed supports load **vertically** . . . by only the structure directly beneath it.

BUT THIS . . . Salted road. Because of greater compaction, same load is diffused **horizontally.** Strain is spread outward and downward to about 40 inches at base to each surface inch.

3. All-Weather Resistance Means Lower Maintenance Costs!



EXCESS MOISTURE. Binding materials are not washed out. Clay, with brine, forms colloidal jelly. Repels excess rain, keeps it from weakening structural strength of mix.

EXCESS DRYNESS. Salt recrystallizes. Fills voids. Holds clay binder. Forms protective shield which retains some moisture in mix, resisting suction-like action of traffic.

FREEZING. Salt lowers freezing point. Frost does not penetrate. Prevention of below-surface freezing helps eliminate spring "heave" and pot-holing.

"Nature's own Soil Stabilizer"

For Base . . . Surface . . . and Shoulder Stabilization . . .

STERLING ROCK SALT

INDUSTRIAL DIVISION
INTERNATIONAL SALT COMPANY, INC., SCRANTON, PA.

FREE PAMPHLETS! Up-to-the-minute methods of highway construction and maintenance.
International Salt Co., Inc., Industrial Division, Scranton 2, Pa.

☐ Please send Road Stabilization literature.
☐ Please have representative call.

Name_____

Company_____

Street_____

City_____ Zone___ State_____

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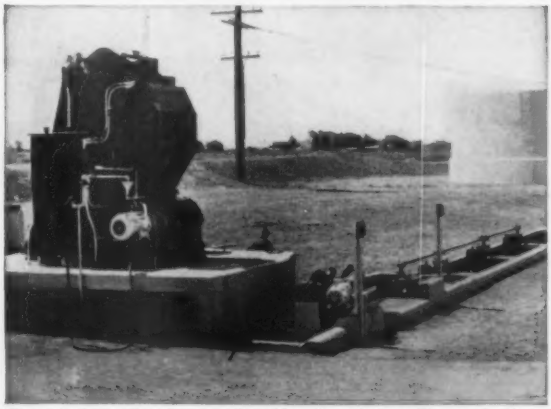
GRUENDLER CRUSHER & PULVERIZER CO. "Established in 1885"

Now, over 200 Gruendler SEWAGE SHREDDERS including GARBAGE GRINDERS

installed by Municipalities in U.S.A.

(list of installations in your vicinity, on request)



Typical Gruendler Sewage Shredder Installation, Tracy, California

Gruendler patented Sewage Screening Shredders are nationally recognized by public sewage works for their efficient method of disintegration of wastes including rag stock, for uninterrupted flow.

WRITE FOR BULLETIN SG10

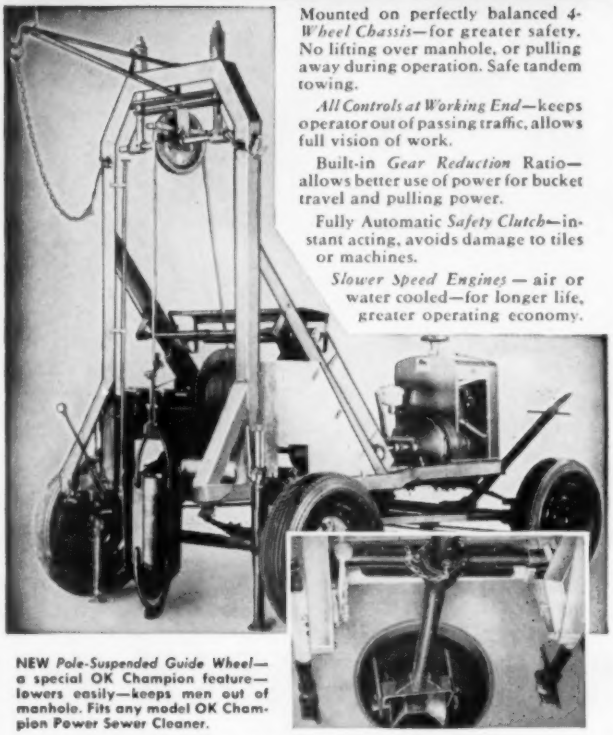
Mfgrs. of Dry Sludge Shredders, Refuse & Compost Grinders

GRUENDLER

CRUSHER & PULVERIZER CO.

2915 North Market Dept. PW6 St. Louis 6, Mo.

OK CHAMPION POWER SEWER CLEANERS



Mounted on perfectly balanced 4-*Wheel Chassis*—for greater safety. No lifting over manhole, or pulling away during operation. Safe tandem towing.

All Controls at Working End—keeps operator out of passing traffic, allows full vision of work.

Built-in *Gear Reduction* Ratio—allows better use of power for bucket travel and pulling power.

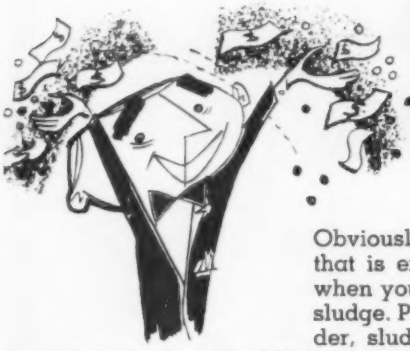
Fully Automatic *Safety Clutch*—instant acting, avoids damage to tiles or machines.

Slower Speed Engines—air or water cooled—for longer life, greater operating economy.

NEW *Pole-Suspended Guide Wheel*—a special OK Champion feature—lowers easily—keeps men out of manhole. Fits any model OK Champion Power Sewer Cleaner.

Write for latest OK Champion Circular

CHAMPION CORPORATION • 4752 Sheffield Ave. • Hammond, Ind.



CAN YOU AFFORD TO THROW MONEY AWAY?

Obviously, the answer is "no". But that is exactly what you are doing when you burn or bury your sewage sludge. Prepared with a Royer Shredder, sludge is a valuable fertilizing material, easily saleable to florists, nurserymen, golf courses and gardeners. By making this product available to your community you are doing them a service and at the same time earning a cash return.

The operation is simple. Sludge cake direct from the drying beds is fed into the hopper of the Royer Shredder where it is shredded, mixed, aerated and discharged to bag, pile or truck . . . free of all trash, ready for use. Low capacity, hand fed units are available for small operations . . . huge, bucket loaded 150 cubic yard per hour models for larger disposal plants.

Don't throw money away . . . either by unnecessary disposal costs or by failing to sell a wanted product. Send for Bulletin 55-S giving complete information on the Royer Shredder and its use in sewage sludge disposal.

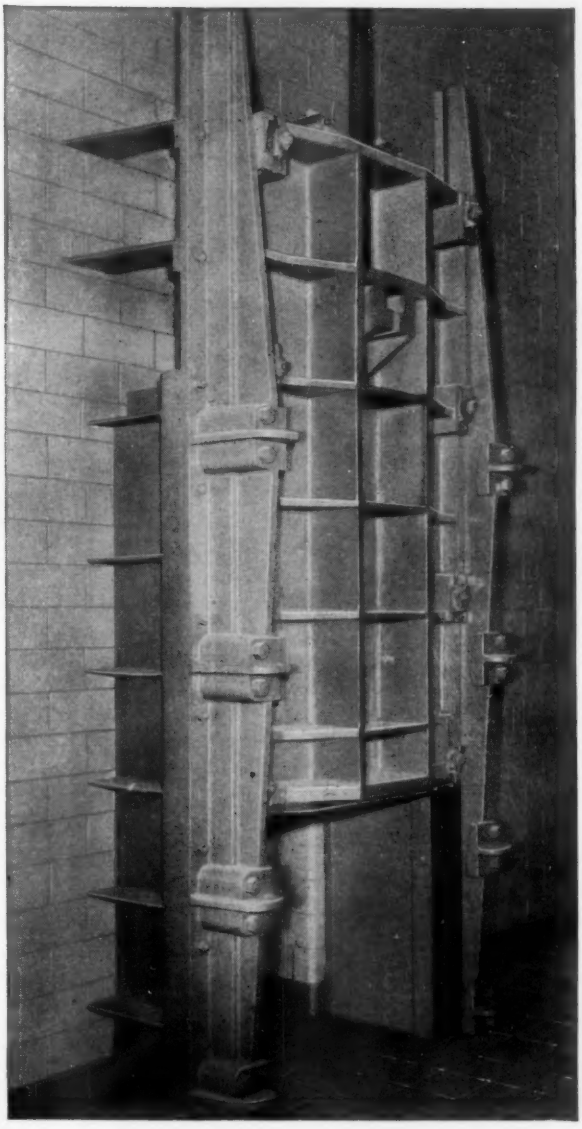
ROYER foundry & machine co.

157 PRINGLE ST., KINGSTON, PA.

ROYER

NEW

The Rodney Hunt HY-Q Sluice Gate



Installation of 42" x 84" HY-Q sluice gate in partially opened position. Note unobstructed smooth surface at invert.

The Rodney Hunt HY-Q* Sluice Gate with *flush bottom closure* is designed to give water control engineers far greater design flexibility than they have ever known before. Exceptional advantages result when the HY-Q gate is designed into water filtration, sewage treatment, and power plants. In fact, practically all sluice, dam, channel and chamber flow control is improved by its installation.

A resilient seal on the movable gate disc seats tightly on the stop bar which is *flush* with the invert. This is the first major development in sluice gate design in many years.

The new patented design gives greater flow control for any specified clear opening, reduces turbulence, automatically clears the flow passage of debris, increases head and provides complete drainage. You will need to know more about the remarkable Rodney Hunt HY-Q Sluice Gate.

*HY-Q is a trademark of Rodney Hunt Machine Co.

Send this coupon for Bulletin No. 75, a 12-page brochure with full technical details.

RODNEY HUNT MACHINE CO.
Orange, Massachusetts

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RODNEY HUNT®

RODNEY HUNT MACHINE CO.
82 LAKE ST., ORANGE, MASSACHUSETTS, U.S.A.

QUALITY WATER CONTROL EQUIPMENT SINCE 1840

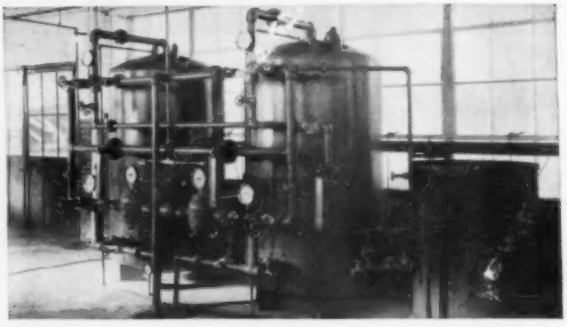
Get full details of this month's products . . . mail your Readers' Service card today.

Roberts Filter *means . . .*

MUNICIPAL WATER PURIFICATION

The combined capacity of Roberts-equipped filtration plants is well over 5 billion gallons (5,000,000,000) per day. Regardless of the size of the plant or the nature of the filtration problem, Roberts Filter can be depended upon for equipment that is reliable in years of service.

INDUSTRIAL WATER RECTIFICATION

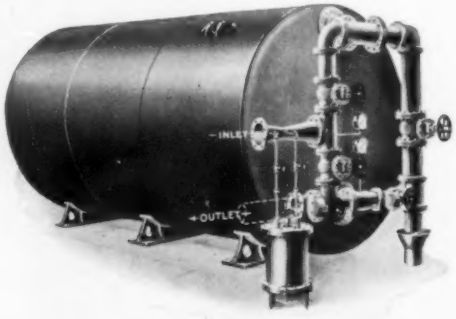


Water treatment has long been a specialty of Roberts Filter. Zeolite water softeners are guaranteed to meet all requirements for which recommended, and are available in a wide range of capacities. Roberts water conditioning equipment is widely used to control precisely the desired chemical content of water for industrial use.

SWIMMING POOL RECIRCULATING SYSTEMS

The combination of thoroughly clarified water and efficient recirculation are features for which Roberts pools are famous. Systems for both outdoor and indoor pools are designed and installed by men long experienced in the conditions peculiar to a successful swimming pool installation.

PRESSURE FILTERS



Closed pressure filters have wide usage where gravity filters are not justified. Roberts vertical filters are available in standard types from 12″ to 96″ diameter; horizontal pressure filters are all 8′0″ in diameter and in varying lengths from 10′0″ to 25′0″.

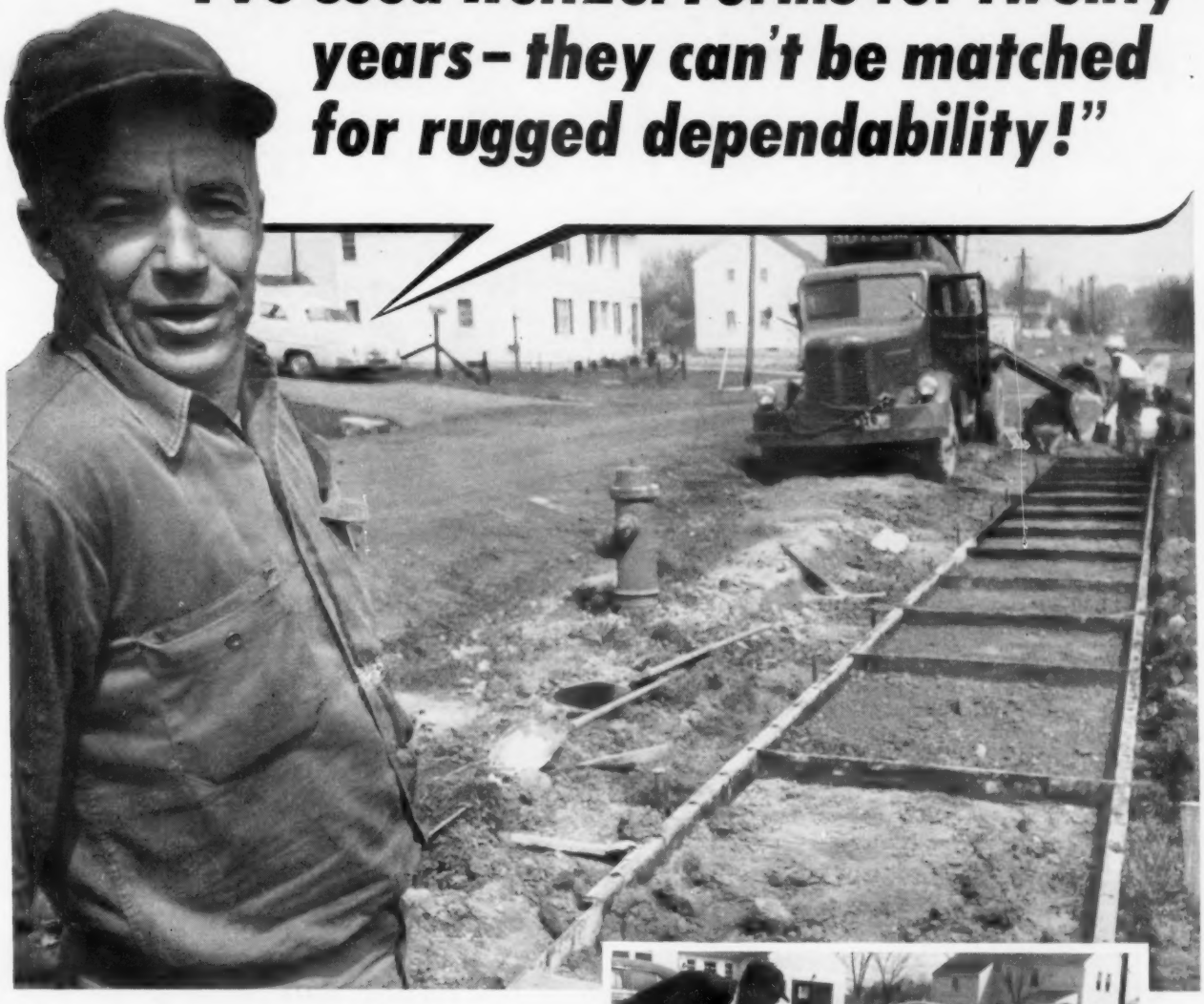
When you think of good water—think of Roberts Filter

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

Roberts Filter

Manufacturing Company • Darby, Pennsylvania

"I've used Heltzel Forms for twenty years – they can't be matched for rugged dependability!"



"Heltzel Steel Forms—both sidewalk and curb and gutter—are all they're reputed to be," states E. W. McShaffery, Ohio contractor. "They're quick setting, easy to align and they strip like they're supposed to. What's more they're built to last. I've used other makes, but none deliver the year-in, year-out service I get from Heltzel Forms."

There are hundreds of contractors like Mr. McShaffery who, through experience, know you can't beat Heltzel Steel Forms when it comes to service, dependability and extra long wear.

Make your next forms Heltzel, and you, too, will understand why more and more of America's leading contractors specify Heltzel all along the line.

Heltzel builds a complete line of sidewalk, curb, curb and gutter, highway, airport, foundation and special steel forms.

THE HELTZEL STEEL FORM & IRON COMPANY

37000 Thomas Rd., WARREN, OHIO

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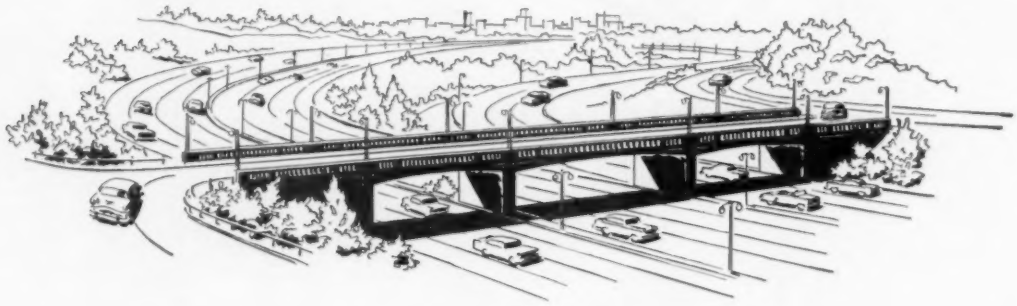
Whatever the size of an expanded highway program



● ● ● *America's construction industry has the capacity to carry out the work.*

● ● ● *This work can be done immediately — with maximum economy and efficiency.*

● ● ● *Through the contract method, the public will receive increasing value for its investment in highway construction.*

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NATIONAL HEADQUARTERS, MUNSEY BUILDING, WASHINGTON 4, D.C.

The ***Contract Method*** *of Construction Safeguards Public Funds*

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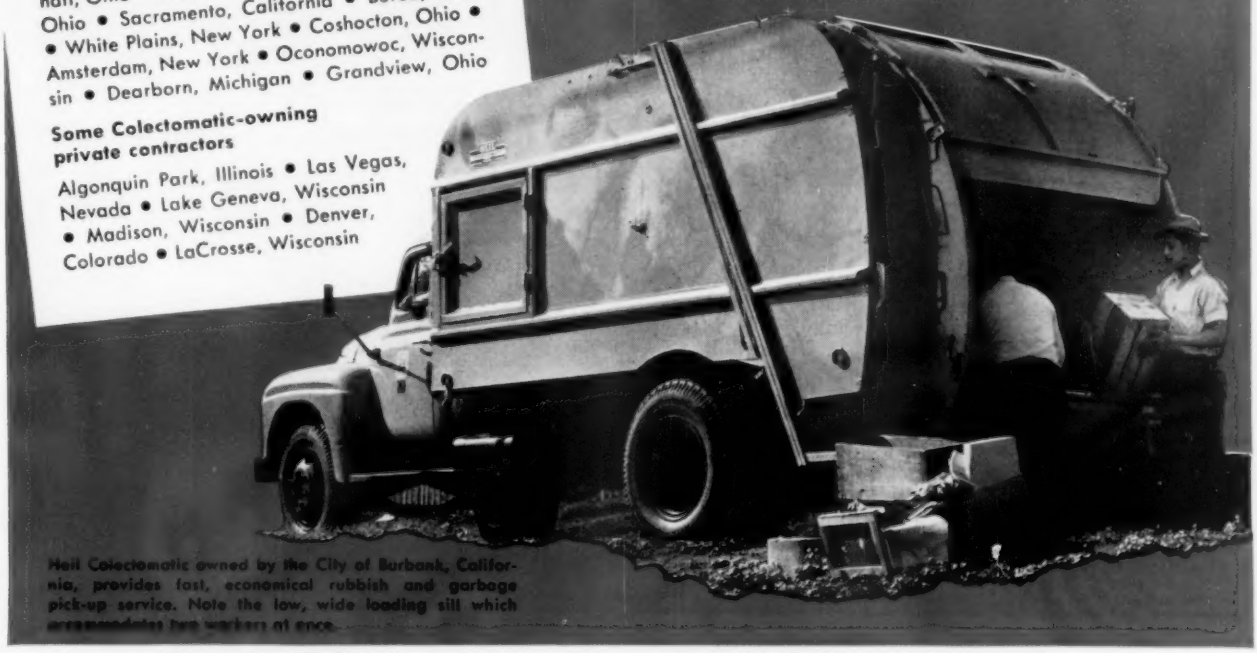
Simplicity—Efficiency—Easy Maintenance prove the superiority of HEIL COLECTOMATICS from coast to coast!

A few typical municipal owners

Bismarck, North Dakota • Milwaukee, Wisconsin • Des Plaines, Illinois • Burbank, California • Sterling, Colorado • Cody, Wyoming • Cincinnati, Ohio • West Allis, Wisconsin • Chillicothe, Ohio • Sacramento, California • Berea, Ohio • White Plains, New York • Coshocton, Ohio • Amsterdam, New York • Oconomowoc, Wisconsin • Dearborn, Michigan • Grandview, Ohio

Some Colectomatic-owning private contractors

Algonquin Park, Illinois • Las Vegas, Nevada • Lake Geneva, Wisconsin • Madison, Wisconsin • Denver, Colorado • LaCrosse, Wisconsin

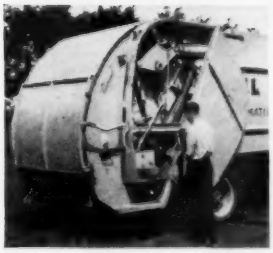


Heil Colectomatic owned by the City of Burbank, California, provides fast, economical rubbish and garbage pick-up service. Note the low, wide loading sill which accommodates two workers at once.

SOME OF THE NEW COLECTOMATIC FEATURES THEY LIKE

FULLY AUTOMATIC OPERATION — A touch of the lever starts the automatic loading-packing cycle. Only 3 hydraulic cylinders do all the work, compared to the usual 5 or 6 in other rear loading units. Maintenance problems and costs are slashed!

FAST "BULLDOZER" PACKING CYCLE — Completed in 23 seconds. Packing plate *rolls* refuse out of the hopper and into the body. Tons of pressure compact the maximum amount of material into the big body and the packing plate holds it there. No retainer plate is needed!



MOST ACCESSIBLE FOR SERVICE — Just open the sectional panels on both sides of the tailgate. The entire working mechanism is within easy reach from a standing position!

When a piece of equipment starts selling like hot cakes the minute it's introduced—and continues in demand month after month, from coast to coast—*it's proof positive* of the superior features that make Heil Colectomatics outstanding for fast, clean, economical refuse pick-up.

Heil Colectomatics are "made to order" for you! Every improved-design feature is the result of suggestions from municipal operating crews, inspectors, supervisors and private refuse hauling contractors . . . the men who know refuse collection best.

Ask for a demonstration of the Colectomatic in action; watch it zip through a regular pick-up route; see for yourself its easy, convenient safe operation; check on the low maintenance features. Call or write today to arrange a Colectomatic demonstration convenient to you.

SEE THE HEIL MOVIE, "Made to Order", describing every Colectomatic feature in full sound and color. Address requests for free use to The Heil Co., Body and Hoist Division, Milwaukee 1, Wis.

THE HEIL CO.

Factories:
Milwaukee, Wis.—Hillside, N. J.—Lancaster, Pa.

DEPT. 4465, 3044 W. MONTANA ST., MILWAUKEE 1, WIS.

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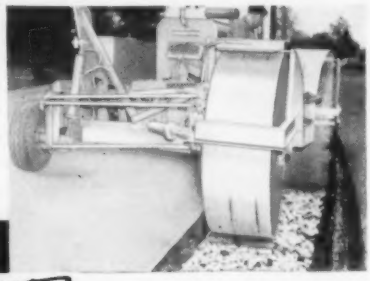
BLAW-KNOX ROAD WIDENER
Spreads 500 tons per day!

This job really rolled for D. E. Smith, Inc. of Mifflin, Pa. Their contract called for widening 3/4th of the stretch from 18′ to 22′, and the balance from 20′ to 24′, spreading 2″ of fines in the bottom of a 3-ft. wide trench and, after compaction, spreading 10″ of No. 4 crushed stone on top of the fines. *The Blaw-Knox Model 95 Road Widener, spreading 500 tons per day, widened approximately 3200′ of highway every 10 hours!*

In addition to speeding operations, Blaw-Knox Road Wideners also lay concrete without forms, handle asphaltic concrete, dirt, gravel, stone or any kind of aggregate. They handle any widening job from 2′ to 10′ widths. They have many other time and money saving features your Blaw-Knox distributor will gladly explain. Call him today.

BLAW-KNOX Dual Compression Trench Rollers

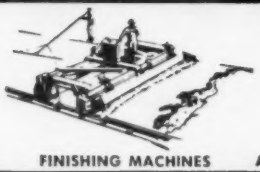
Here's the most flexible and economical trench roller on the market! Width range can be accurately adjusted from a minimum of 20″ to a maximum of 39″, or any intermediate width. The two full-width, 60″ high rolls, used either "dogleg" or tracking each other, *are the equivalent of two separate rollers.*



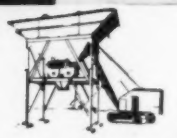
BLAW-KNOX COMPANY CONSTRUCTION EQUIPMENT DIVISION PITTSBURGH 38, PA.

Ask about the **BLAW-KNOX** *"Complete Package"* of CONCRETE PAVING and READY-MIX EQUIPMENT

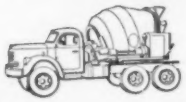
CONCRETE SPREADER-VIBRATORS



FINISHING MACHINES



AGGREGATE BATCHING PLANTS



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CONSTRUCTION CASTINGS

for **Highway • Municipal • Building**
Industrial • Communication
Public Works • Airport
Utilities • Transportation

Patterns for 15,000 different Gray Iron Castings used on Construction Projects.

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NEENAH FOUNDRY CO.
NEENAH, WISCONSIN

Chicago Office 308 W. Washington St., Chicago, Ill.

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STOP THE CAUSE OF LEAKAGE...*for good!*

By recaulking a leaky bell-and-spigot joint, you are not removing the condition that caused its failure. You still have a rigid joint that might leak again under pipe movement, vibration, other line stresses.

Dresser Bell-Joint Clamps *eliminate this cause* of leakage by sealing the joint with a resilient rubber gasket that absorbs pipe stresses, remains tight for the life of the line.

Wherever you have gone to the trouble and expense of uncovering a bell-and-spigot joint—*for any reason*—give it absolute protection against future failure with a Dresser Bell-Joint Clamp, Style 60! Order from your local supplier today, or write us.

15th ANNIVERSARY THE DRESSER WAY 1880·1955

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BELL-JOINT CLAMPS

Dresser Manufacturing Division, 69 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston; 101 S. Airport Blvd., S. San Francisco. Sales Offices also in: New York, Philadelphia, Chicago, Toronto.

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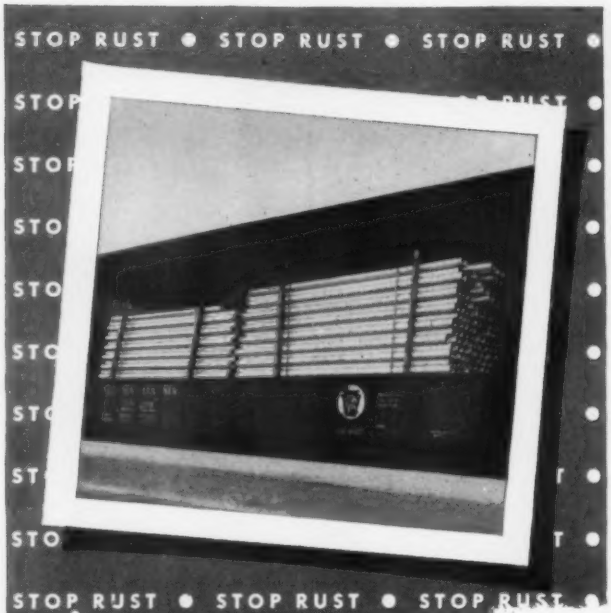
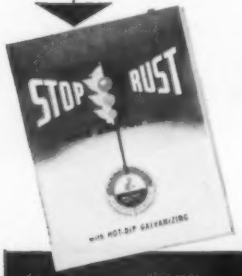
Get full details of this month's products . . . mail your Readers' Service card today.



It's Hot-Dip Galvanized

Here's a carload of spiral pipe on its way. Wherever it's installed, you can be sure of trouble-free service. That's something to consider with today's high costs of maintenance. It is estimated that corrosion is costing the United States over five billion dollars a year. By having your products Hot-Dip Galvanized you can greatly reduce these costs. Hot-Dip Galvanizing is more than just a coating, because with Hot-Dip Galvanizing the zinc actually becomes an alloy with the base metal. This means your products will last longer.

Whatever the product may be, if it's iron or steel, have it protected with Hot-Dip Galvanizing. For the best in galvanizing send your products to a member of the AMERICAN HOT DIP GALVANIZERS ASSOCIATION . . . . he has the know-how to give you a top quality job.



Send today for our new booklet "Stop Rust." It gives you the full story on the process, plus a comprehensive coating comparison chart. "Must It Rust" 16 mm film available for showing.

AMERICAN HOT-DIP GALVANIZERS ASSOCIATION
1506 FIRST NATIONAL BANK BLDG., PITTSBURGH 22, PA.

HERE IS A REVOLUTIONARY NEW POCKET-SIZE LEAK DETECTOR

THAT WILL PAY FOR ITSELF IN ONE COMPLETE OPERATION

Sensitive—as only modern electronics knows sensitivity.

Compact—weighs only 2¼ pounds and fits conveniently into a coat or jacket pocket.

Simple—any maintenance man quickly learns how to use it. In one typical small city, meter readers used them to find an average of three leaks per day.

Rugged—Operating records show it working perfectly in all sorts of weather, even when handled roughly by different operators.

Efficient—One man can do a complete job of leak detection well. In one small city, these little detectors traced out leaks amounting to almost 10% of the daily pumpage.

Write for prices and complete information.

PRECISION ELECTRONICS CO.
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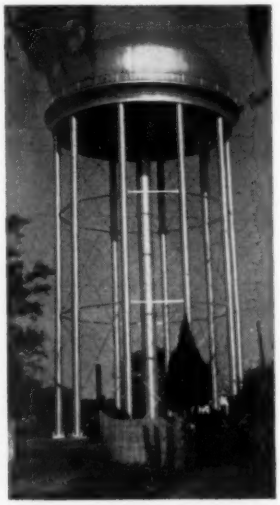

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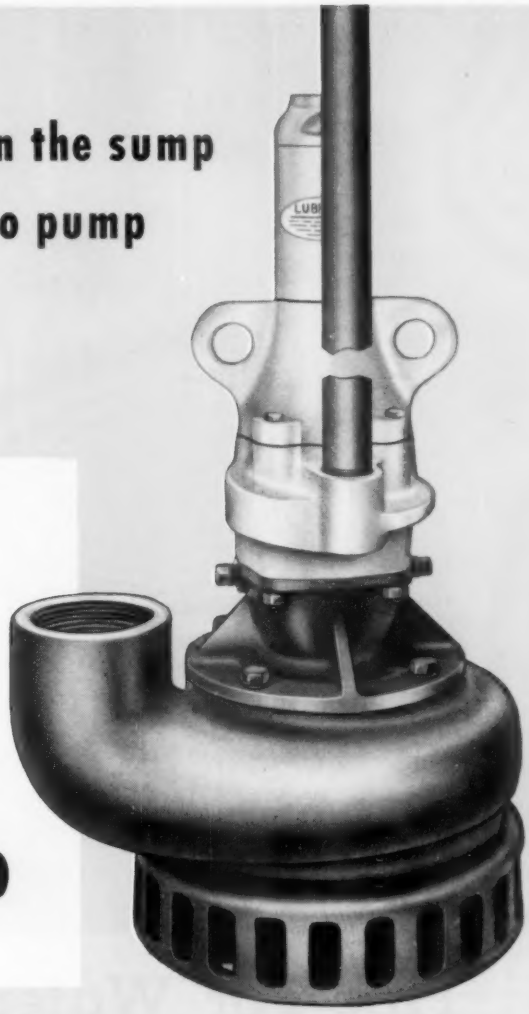

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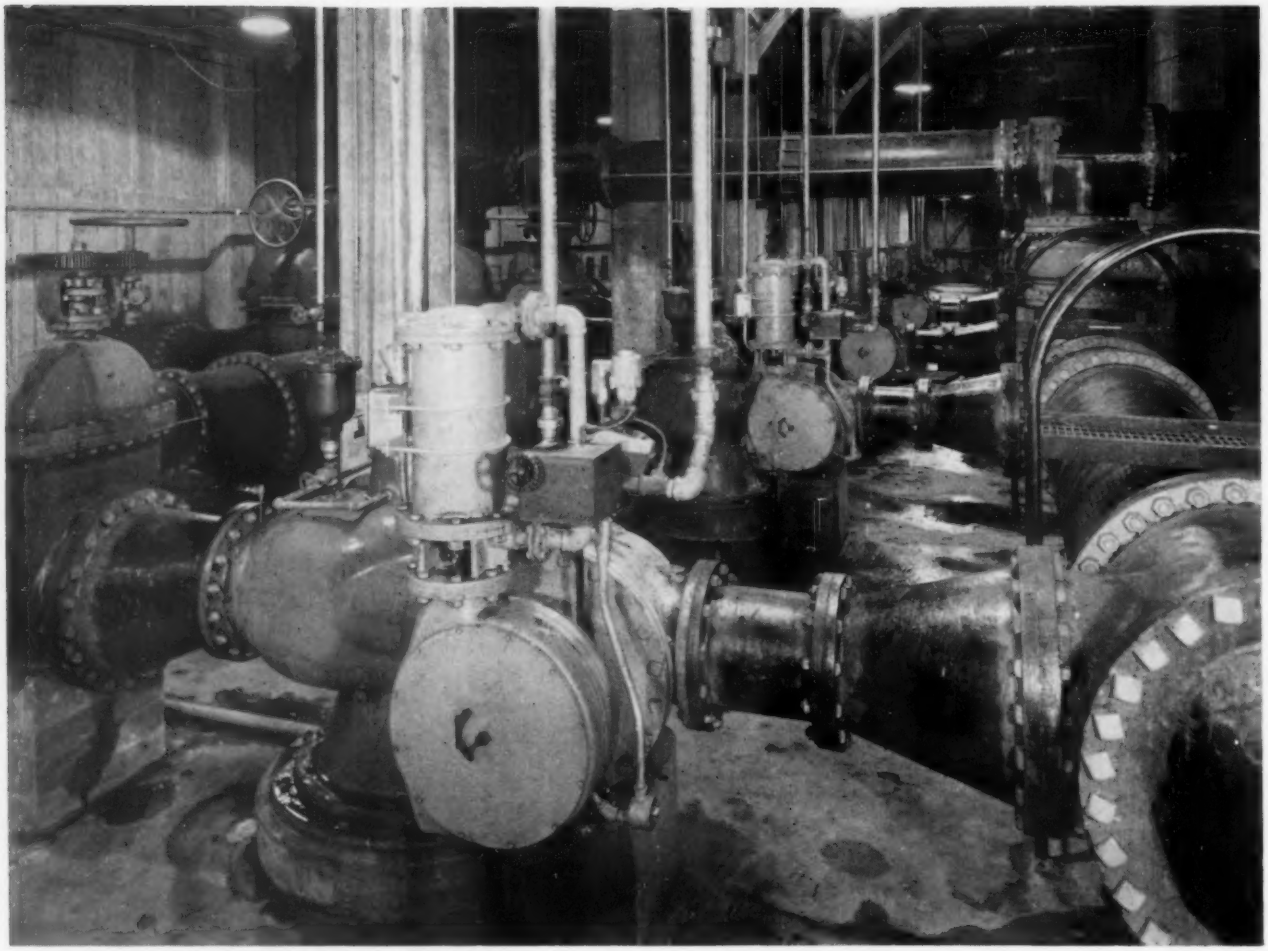

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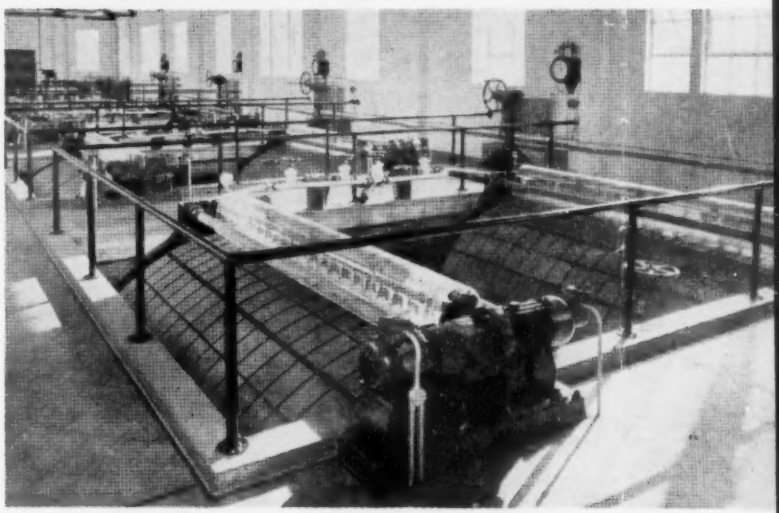
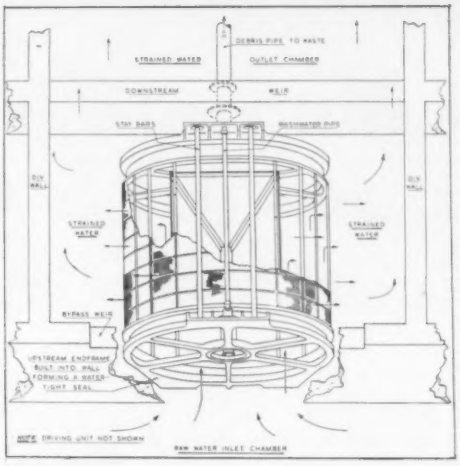


Metropolitan Water Board of London Lee Bridge Installation. Ten 10'0" x 10'0" dia. units, Flow 55 m.g.d. to increase filter output and safeguard against algal invasions.



Micro - straining unit (left) showing flow through the machine and design details. Units are essentially self-cleaning filters which work continuously, eliminating and disposing of the suspended solids from the water flowing through them.

City of Edinburgh Water Dept. Fairmilehead Installation. Six 7'6" x 7'6" dia. units, Flow 15 m.g.d.—primary filtration in front of sand filters (second installation).

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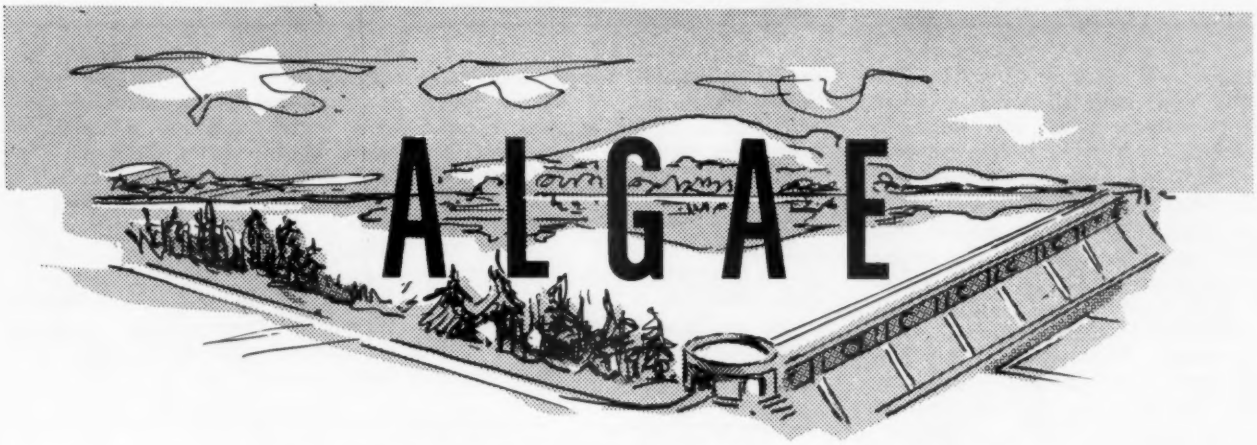


ALGAE

OF IMPORTANCE IN WATER SUPPLIES

C. MERVIN PALMER, Aquatic Biologist, and CLARENCE M. TARZWELL, Scientist Director

Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio

With illustrations in Color by HAROLD J. WALTER

ALGAE are common and normal inhabitants of surface waters and are encountered in every water supply that is exposed to sunlight. Among operators of water treatment plants, the algae are best known as producers of odors and tastes and for their ability to clog sand filters. They have come to be recognized as important in the water supply in many other ways, including their capacity for modifying the pH, alkalinity, color and, in modern times, the radioactivity of the water.

All surface waters contain dissolved and suspended materials which serve as nutrients and support the growth of many kinds of aquatic life, the numbers of which are governed to a great extent by the richness of the water. In addition to the fish, turtles, cattails, water lilies, and other large aquatic animals and plants, there are immense populations of small forms, many of them microscopic in size. These have a major part in affecting the quality of the water and they, therefore, have to be dealt with in the process of preparing water for domestic and industrial use.

Among the microscopic organisms in water are the true bacteria, actinomycetes, molds or fungi, yeasts, protozoa, rotifers, microcrustacea, and algae. The most troublesome of the nuisance organisms are the algae and it is this group which is considered here. While a few of the algae are found in soil and on surfaces exposed to air, the great majority of them are truly aquatic and grow submerged in the waters of ponds, lakes, streams, and oceans. Although they are most abundant during the summer they can also be found, sometimes in large numbers, in the winter, even under the ice cover. A majority of them are microscopic in size but they may develop in such large numbers that they produce readily visible masses. In many instances, it is this ability to give rise to such large masses of material that is the basis for their importance in water supplies. Comparatively low concentrations of most of the algae are generally advantageous in raw water.

The algae differ from the other groups of microscopic organisms in having an internal green pigment called chlorophyll, sometimes hidden or partially hidden by other pigments. This enables them in the presence of sunlight to combine water and carbon dioxide to form starch or related substances, with the release of oxygen into the water. This process is known as photosynthesis and is absent in all typical bacteria, actinomycetes, fungi, protozoa, and crustacea. The oxygen produced by the algae represents waste material or a by-product of photosynthesis. The chlorophyll is an organic catalyst essential in ini-

tiating and carrying on the process. The algae have the green pigment in common with the flowering plants, conifers, ferns, and mosses.

The algae make possible important chemical changes through their continuous release of oxygen into the water during daylight hours. The oxygen helps to prevent foul or septic conditions from developing in the water by stimulating the activities of aerobic rather than anaerobic bacteria, and is available for the respiration of all types of animals from the fish on down to the smallest forms of protozoa. Many fish kills in lakes and reservoirs are due to the lack of sufficient oxygen in the water. The algae constitute a primary source for continuous renewal of this essential element in most bodies of quiet water.

Another important chemical effect of algae is the continuous removal of carbon dioxide from the water during the daylight hours. This brings about a chain reaction in which soluble (unbound) carbonates replace the free carbon dioxide in the water and this in turn affects the half bound and bound carbonates. All of this brings about a change in the total hardness of the water. Vigorous algal growths have been known to reduce the water hardness by as much as one-third.

This change in carbon dioxide and hardness also tends to change the pH of the water. The pH will increase as the algae increase their photo-synthetic activity during daylight hours. The pH then decreases at night when the algae are not carrying on photosynthesis. These changes in hardness and in pH must be taken into account at the water treatment plant since they may require changes in the dosages of chlorine and other chemicals added to the water at the plant.

Corrosive activity of the water is also often increased as a result of algal growth. This can have far-reaching effects on the pipes in the distribution system and on many industrial processes where water is in contact with machinery. In California, algae attached to the metal walls of sedimentation tanks caused deep pits to be formed in the metal as a result of the depolarizing action of the oxygen produced by the algae.

Increasing attention is now being paid to algae which produce toxic organic substances that have caused the death of many kinds of both wild and domestic animals. However, there appear to be few records of algae which are toxic to humans although they have several times been looked upon with suspicion as the possible cause of outbreaks of gastro-intestinal disorders.

Problems due to algae which have arisen in the providing of suitable water supplies, together with the utilization of some of these same organisms in improving the water supplies and in treatment of sewage, clearly indicate a need for more knowledge of their environmental requirements, life histories, growth, and nutrition. In order to help in meeting this need, research scientists at the laboratories of the Robert A. Taft Sanitary Engineering Center of the Public Health Service in Cincinnati, are studying the various algae of importance in water and sewage.

RECOGNITION OF ALGAE IMPORTANT IN WATER SUPPLIES

Experience in water and sewage treatment plants has demonstrated that there is great difficulty in recognizing the various algae that are encountered and in determining which ones of the many present are really significant. To meet this problem biologists at the Engineering Center have selected those which appear to be the most important and have combined their efforts with those of an artist to produce a considerable number of illustrations of the algae shown in their natural colors. These have been grouped together in a series of six plates. Obviously only a fraction of the total number of algae are included since more than 20,000 species are known to exist. The algae illustrated include the unicellular and colonial forms, both flagellate and sedentary, and the more extensive simple and branching filaments. The flagellates have often been placed in the animal kingdom with the protozoa because of their motility, but modern algologists now classify the pigmented flagellates as algae and consider them as swimming plants rather than as photosynthetic animals.

The relative size of the algae on the plates is not indicative of their actual size. Some of the forms illustrated are minute microscopic in size and can be seen only under very high magnification of a compound microscope. *Chrysococcus* on Plate 4 is a good example of such a minute alga, while *Lemanea* and *Cladophora* are much larger, often growing to a length of several inches. Thus, the magnification is not the same for the various algae included on the plates but each is enlarged sufficiently to make clear its own particular characteristics.

Botanists recognize many different groups of algae such as the desmids, diatoms, euglenoids, blue-greens, and greens. The algae which are displayed on the six plates, however, are grouped according to their significance to sanitary scientists and not with regard to their evolutionary relationship as botanists would normally classify them. A limited number of common names can be used for the algae, but, in general, no common terms exist for most of them. Consequently, they have to be designated by their scientific names.

The six plates of algae represent three areas of concern for plant operators, the water treatment plant, sewage treatment, and water reservoirs. Taste and odor and filter clogging are two of the most troublesome problems faced by many operators in water treatment plants. Representative algae associated with these two conditions are illustrated on Plates 1 and 2. In water pollution, natural stream purification and sewage treatment, the significant algae are those whose growth or survival is closely related to the amount and composition of sewage in the water. Plates 3 and 4 illustrate the contrasting groups of polluted water and clean water algae.

Finally, in the reservoirs and settling basins of water supply systems are encountered the drifting and the

ALGAE IMPORTANT IN WATER SUPPLIES

TASTE AND ODOR ALGAE

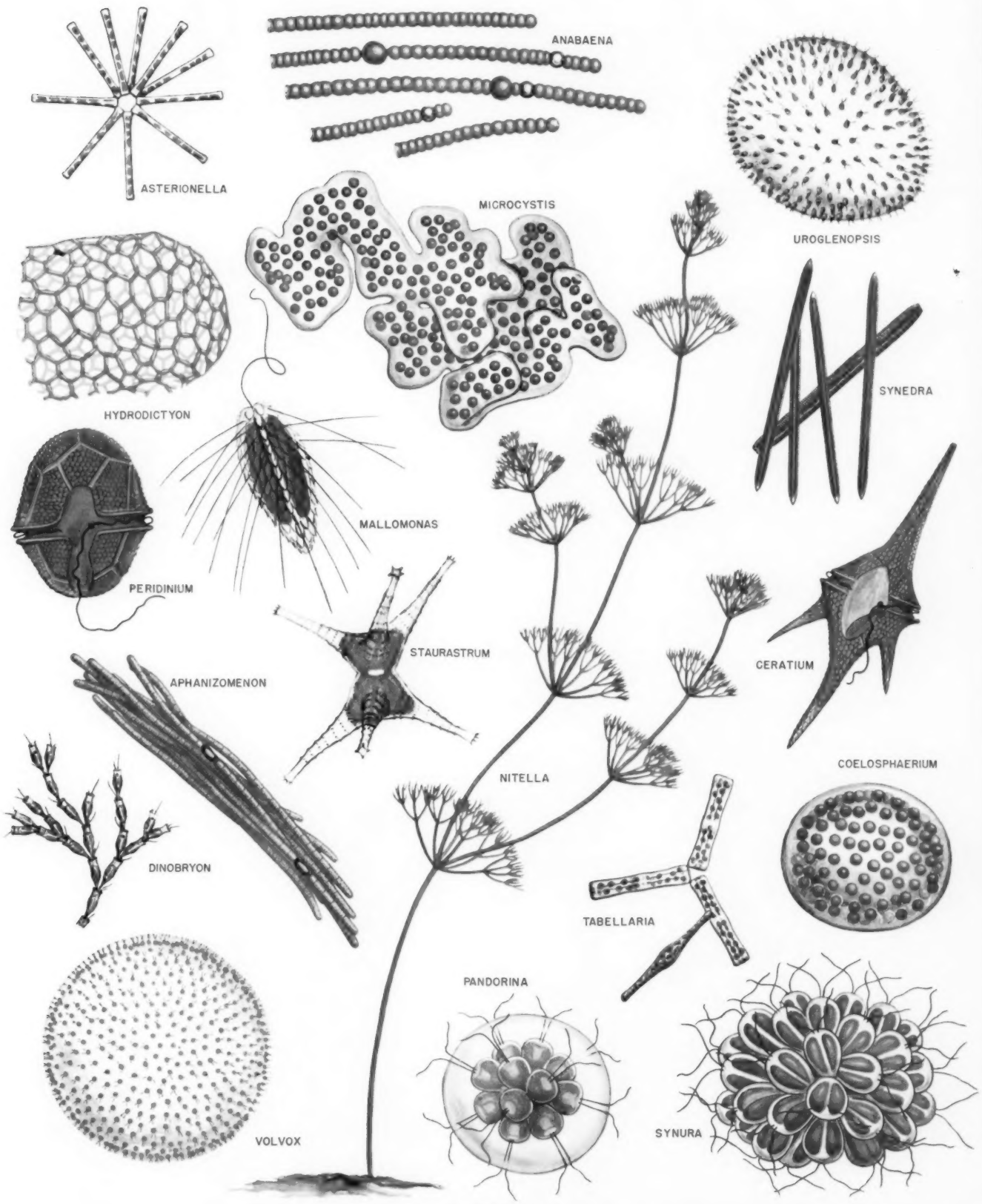


PLATE I

FILTER CLOGGING ALGAE

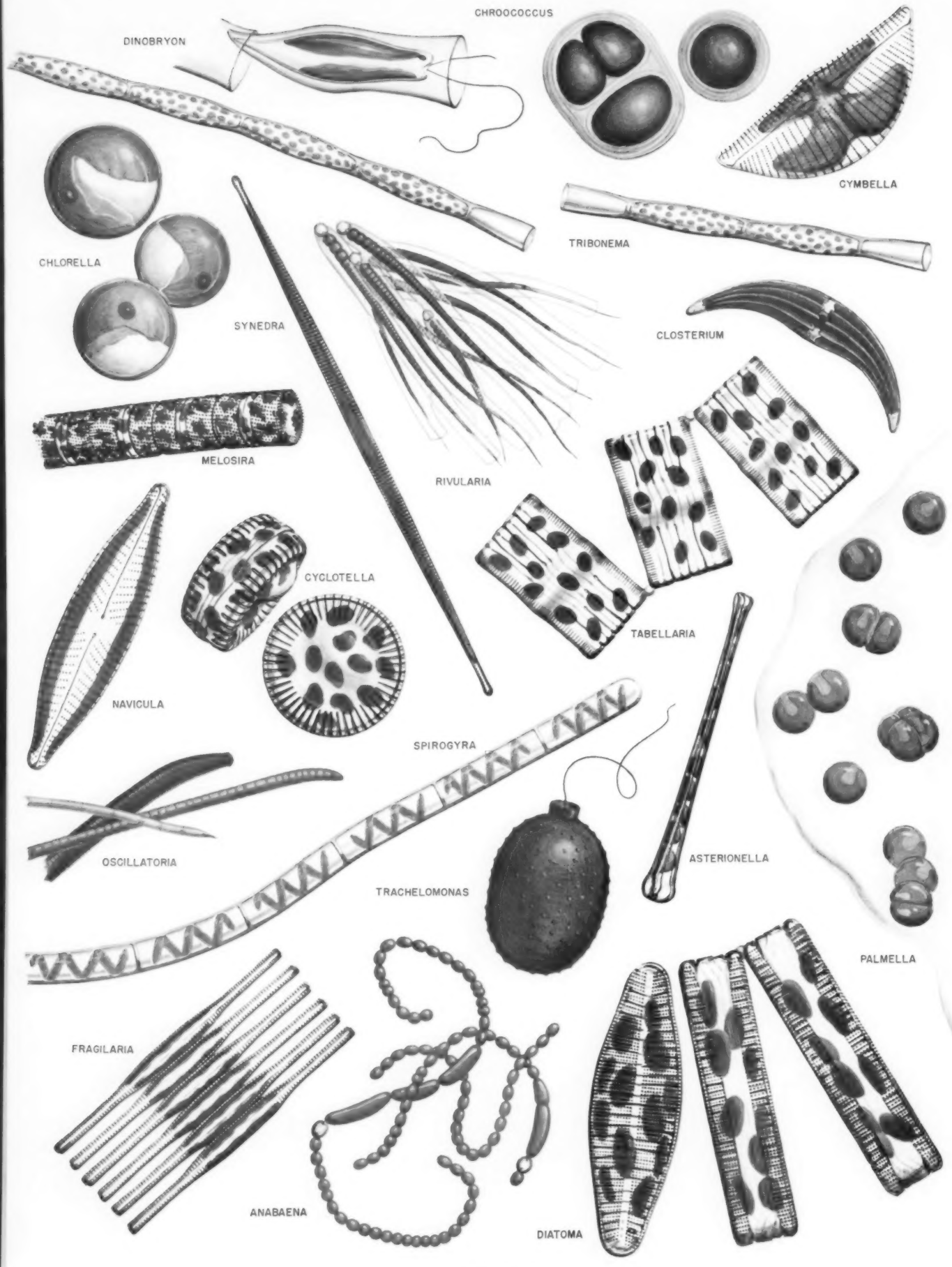


PLATE 2

attached growths of algae which can become troublesome in the reservoirs and can give rise also to the forms that cause nuisance conditions in the treatment plant. Plates 5 and 6 illustrate respectively the drifting, surface water algae and the attached algae of reservoirs and lakes.

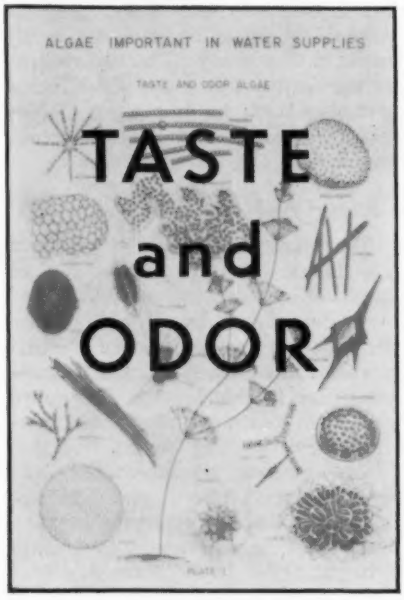


Plate 1 includes those forms which have been most frequently associated with tastes and odors in water. Certain diatoms, blue-green algae, and pigmented flagellates are the principal offenders. *Synura* is one of the more potent algae in production of an odor in water. Its odor is often described as resembling that of a cucumber. A comparatively few cells per ml may be sufficient to cause a very perceptible odor. Other flagellates and diatoms may develop a fishy odor. In Massachusetts, for example, *Dinobryon, Uroglenopsis,* and the "armored" flagellate *Peridinium* produced a strong fishy odor in a large reservoir holding over six hundred million gallons of water. These forms developed in February under a 16-inch layer of ice. There is some evidence that *Uroglenopsis* is stimulated to rapid growth following an abundant growth of other algae. The other flagellates illustrated on Plate 1 are *Mallomonas, Pandorina, Volvox,* and *Ceratium.* The flagellates, together with the diatoms, *Asterionella, Synedra,* and *Tabellaria,* are some of the most common offenders in taste and odor production.

Certain blue-green algae are blamed for the very foul "pigpen" odors in water and the four illustrated on Plate 1 are *Anabaena, Microcystis, Coelosphaerium,* and *Aphanizomenon.* All of these are capable of developing in large masses sufficient to form water "blooms." The foul odor develops at least in part as products of decomposition as the algae die off. Green algae are less often associated with tastes and odors in water. In fact, their growth may help to keep in check the blue-greens and the diatoms and thus be a positive factor in the control of water quality. However, *Hydrodictyon* (water net), the desmid, *Staurastrum,* and the large, massive stone-wart, *Nitella,* may offend rather than help in this biological competition between types.

Research is now being conducted at the Robert A. Taft Sanitary Engineering Center to determine what particular species of algae produce tastes and odors in water and under what conditions this takes place. Suspected forms are obtained in pure growth cultures for this work and chemical analyses are being made of their products which have odor. Additional research is being directed at finding algicides which are sufficiently selective to destroy certain taste and odor algae without at the same time being wasted on non-offending types.

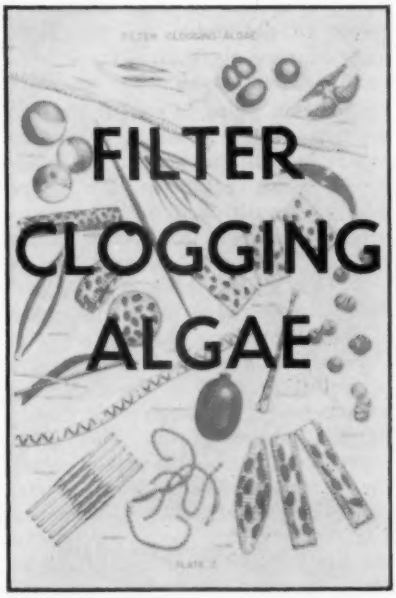


Plate 2 illustrates those algae which have been known to clog the pores in the sand filters of water treatment plants and to require plant operators to clean or backwash the filters frequently to permit water to pass through. Thus the presence of these algae can slow up the process of water purification and add materially to its cost. Both slow and rapid sand filters may be affected, the former being particularly important because of the greater cost of putting them back into use again. It is not yet fully understood why certain algae, more than others, are most effective in reducing the movement of water through the filters. Ability to develop in large numbers is certainly one essential. The rigid wall, such as is found in the diatoms; the copious mucilaginous material around the cells as in the case of *Palmella;* and the tendency to form flakes or a network of strands as in *Fragilaria* and *Tribonema* are factors which play a part.

Diatoms are present during all seasons of the year and are by far the most important group of organisms which clog filters. The most serious offenders are *Asterionella, Fragilaria, Tabellaria,* and *Synedra.* Other diatoms which may occasionally cause this trouble include *Navicula, Cyclotella, Diatoma,* and *Cymbella.* The rigid cell wall of diatoms is composed principally of silica and is not subject to decomposition. Therefore, even though the diatoms may die off rapidly on the surface of the filter, their silica walls remain to plug the pores in the sand.

Algae Growth

In England it was estimated that *Fragilaria,* measured as dry weight, developed in a reservoir to the extent of 16 tons per million gallons of water and made it necessary to remove the huge quantities of this diatom at the water treatment plant. Counts of another filter clogging diatom *Asterionella,* indicated that the organism has reached a density as high as 20,000 per ml.

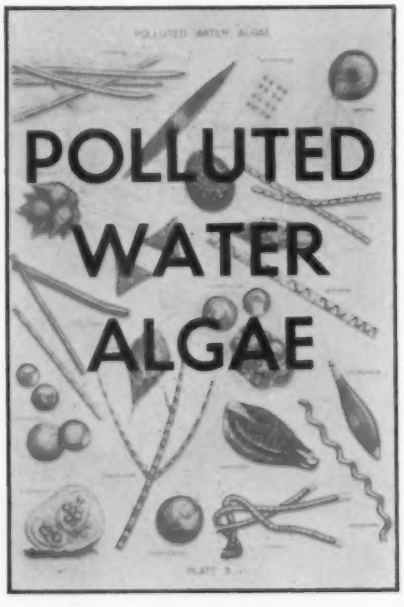
In Chicago, when the water to be filtered contained approximately 700 microorganisms per ml., principally *Tabellaria* and *Fragilaria,* the filter runs were only 4.5 hours. Three days later, when the count was down to approximately 100 per ml., the filter run increased to 41 hours.

The filter clogging blue-green algae are represented on Plate 2 by *Chroococcus, Rivularia, Ana-*

PLATE 2

baena, and three species of *Oscillatoria*. *Anabaena* is known to have caused filter trouble in Illinois and Minnesota while *Oscillatoria* is one of the offenders in Switzerland. *Dinobryon* and *Trachelomonas* are pigmented flagellates, the former being common in the Great Lakes and in the soft waters of the eastern United States. *Chlorella*, *Palmella*, *Spirogyra*, and the desmid, *Closterium*, are green algae while *Tribonema* is a yellow-green filament. *Chlorella* is the algae which has also given trouble by growing on the inner surfaces of the glass bottle in water coolers and in water lines constructed of plastic tubing when these have been exposed to light.

The relationships of algae to sand filters involve, in addition to filter clogging, both the improved filtration given by algae which form a thin soft gelatinous film over the surface of the open slow filter, and the problem caused by passage of certain algae through both rapid and slow filters and into the treated water. A number of the same algae which can clog filters have at other times been the offenders in penetrating them. Algae which have passed through rapid filters include *Synedra* and *Oscillatoria* and through slow filters, *Chlamydomonas*, *Euglena*, *Navicula*, *Nitzschia*, *Phacus*, and *Trachelomonas*.



Algae are of great importance in the natural purification process in streams. In communities where untreated or only partially treated sewage is dumped into streams, the kinds and numbers of algae and other organisms in the polluted portion of that stream are very different from those which are present in the unpolluted stream above the sewer outlet. As the sewage decomposes in the stream the numbers and kinds of microorganisms again change until the flora and fauna are eventually somewhat similar to that found above the point of pollution. The algae represent a conspicuous and significant group in this continuously changing population within a stream that is going through the process of self-purification. This variation in the algal population at different points in the stream constitutes one of the indices which can be used to measure at any desired location the rate of recovery from pollution in the stream.

On Plate 3 are illustrated some of the algae which are found frequently in large numbers in water containing domestic sewage. Thus, they are likely to be present in those portions of streams a short distance below outlets from primary sewage treatment plants. Included in this group of pollution algae are some forms of unusual interest. *Chlorella variegata*, *Anabaena constricta*, and *Euglena viridis* are encountered also on the sludge or in retention basins of sewage treatment plants. *Chlorella* is the alga which is being used in a number of laboratories to determine the feasibility of producing algae on a large scale for food, feed, and other products.

Nitzschia palea is one of the few diatoms which remains alive and active in polluted water. The blue-green algae comprise the group which is most frequently encountered in the polluted portion of the stream. Not all representatives of the group called "blue-green algae" are actually blue-green in color. For example, the three species of *Oscillatoria* illustrated as indicative of pollution tend to be decidedly yellow-green, although they belong in the above group. The other representatives of this group belong to the genera *Phormidium*, *Merismopedia*, *Anabaena*, *Gloeocapsa*, *Lyngbya* and *Arthrospira*. *Oscillatoria* and the swimming alga, *Euglena*, are frequently considered as indicative of pollution but there are actually only certain particular species of each of the genera which are reliable in this respect. The swimming green alga, *Chlamydomonas*, shown near the bottom of the plate is one of the very common organisms in water. The species illustrated is *C. reinhardi*. Many of the non-swimming round-celled green algae are hard to identify and often are mistakenly called *Protococcus*, a type which is common on moist areas of tree trunks. The two round-celled forms indicative of pollution and shown on the chart are *Chlorella variegata* and *Chlorococcum humicola*.

Algae and Sewage Treatment

Treatment and disposal of sewage is an essential process in all large cities and in an increasing number of smaller communities. Most people are unaware of the important role which minute organisms play in this process. The more complete treatment plants are provided with settling basins, trickling filters, various appurtenances, and well-equipped laboratories. The actual stabilization of the sewage, however, is almost invariably brought about by microorganisms.

In this biological process several types of microorganisms are frequently involved. The treatment consists primarily of making conditions ideal for the rapid development of bacteria, molds, protozoa, and rotifers since it is through the activities of these microorganisms that the sewage is changed from an offensive to an inoffensive condition. Recently the algae have received much more attention than they had in the past because of the part they are able to play in oxidation ponds or lagoons, where the algae can be utilized for the production of oxygen essential for the growth of those organisms that break down the organic wastes. In this way it is possible to support immense populations of bacteria and the sewage stabilization process is greatly accelerated. Large open shallow basins or lagoons are required in order that light will be available throughout to stimulate algal growth and activity. Only certain kinds of algae are able to grow in the presence of a high concentration of sewage but these few types may be stimulated to grow and multiply very rapidly. It is only during the time the algal cells are young that they will produce large

CLEAN WATER ALGAE

POLLUTED WATER ALGAE

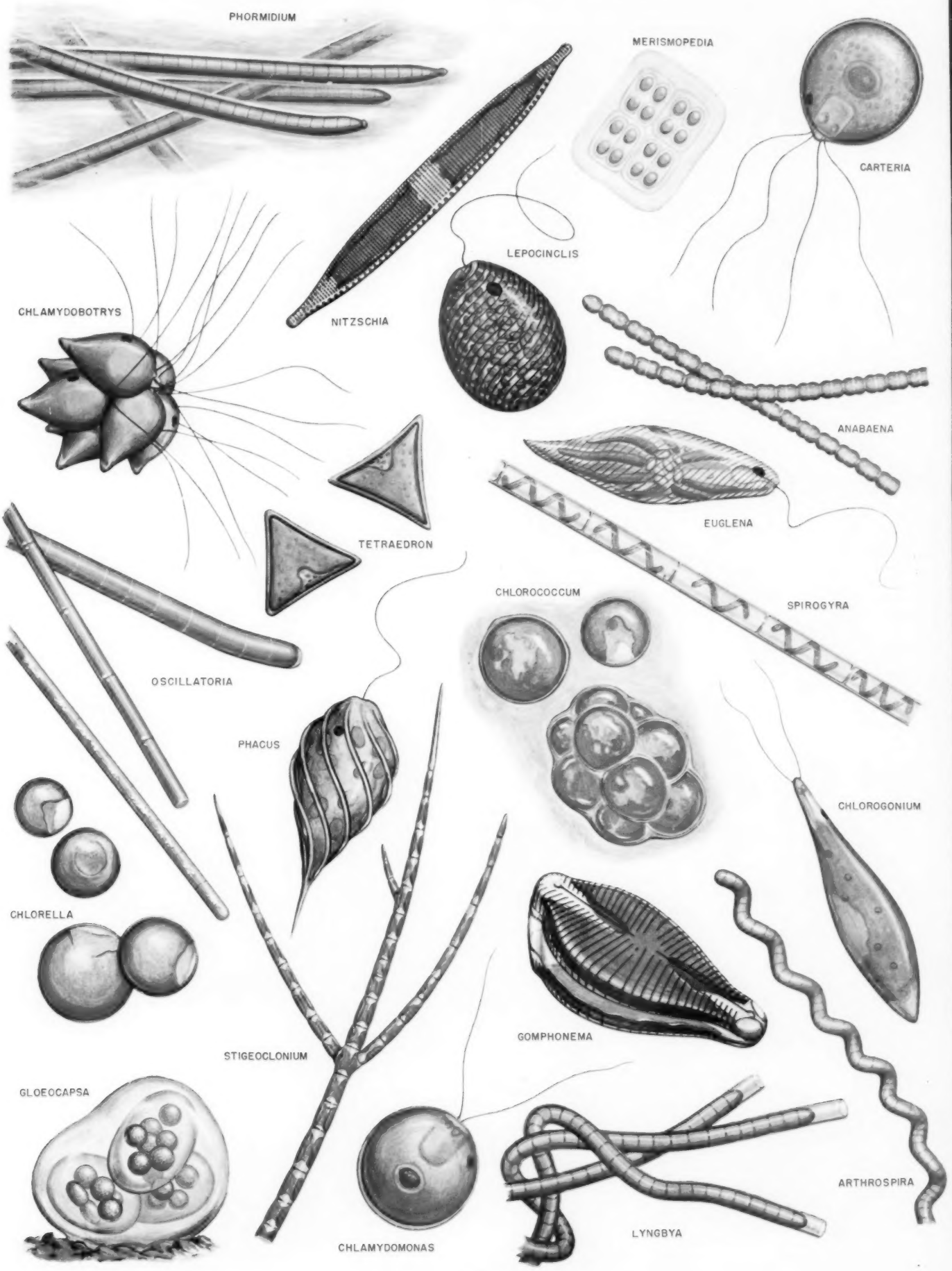


PLATE 3

CLEAN WATER ALGAE

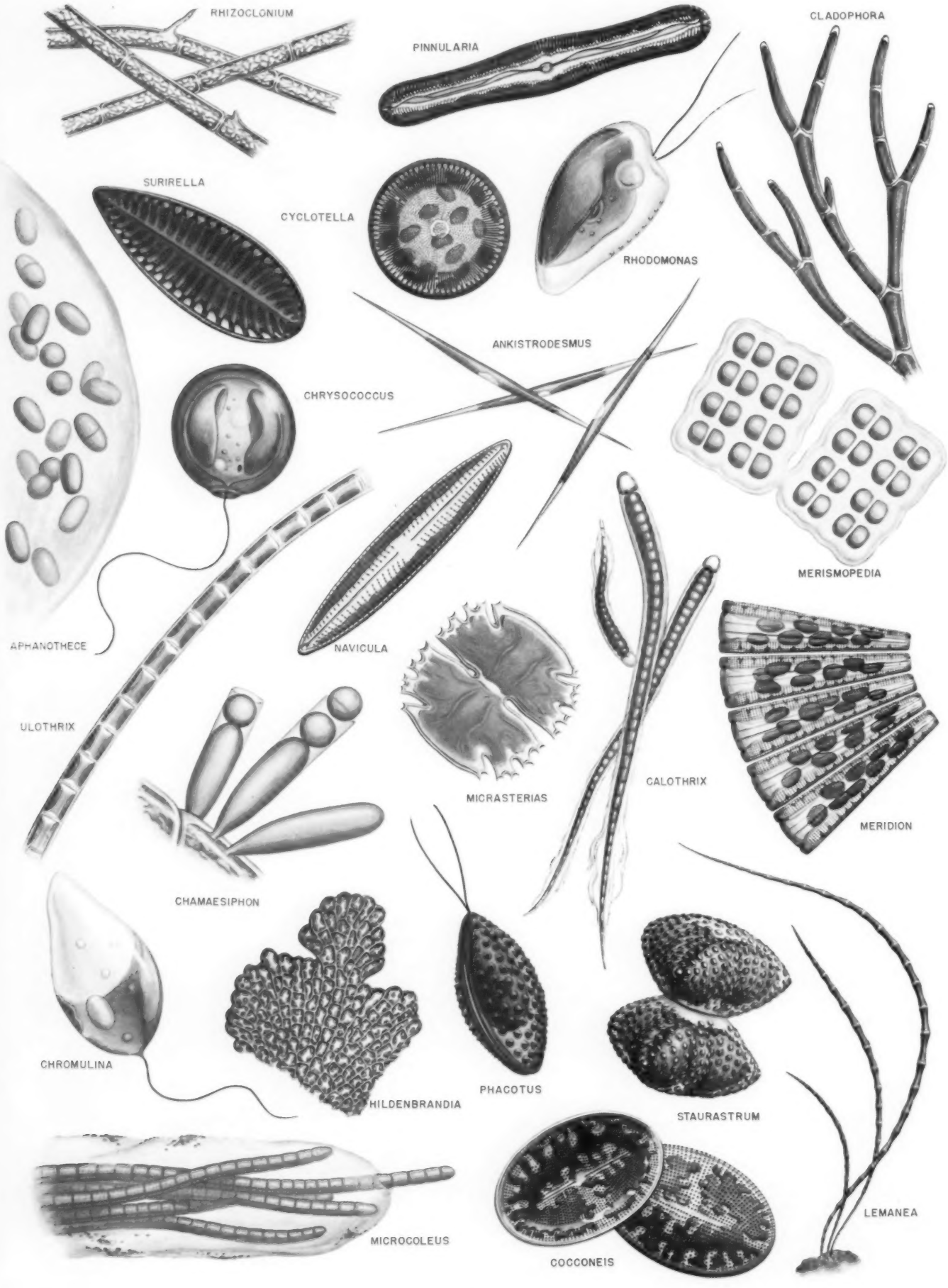


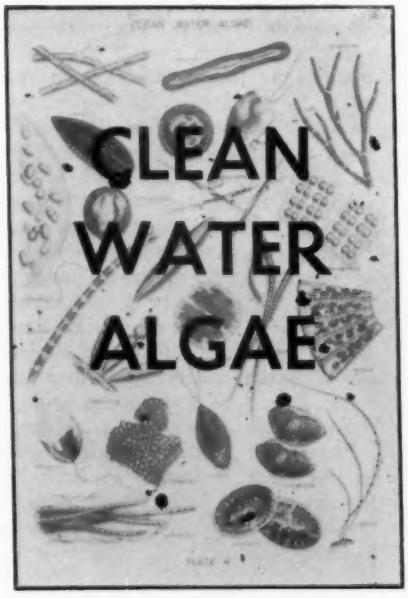
PLATE 4

PLATE 3

quantities of oxygen. This makes it necessary for the multiplication of additional young cells to be a continuous process at the sewage treatment plant. The sewage must be emptied into the shallow open basin or lagoon and allowed to move slowly through it for a day or two while the algae multiply rapidly and produce the oxygen.

The massive growths of algae developing in sewage basins and lagoons may eventually become a new source of fertilizers, vitamins, animal food, and other products of commerce. The algae are proving to be potentially valuable as efficient users of the nutrient salts resulting from decomposition of sewage and might supplement the land plants grown on farms in producing many kinds of organic products of commercial importance and value.

As has already been indicated many of the algae which develop in large numbers in sewage oxidation ponds and lagoons are the same kinds that are present in the polluted water zones of streams and illustrated on Plate 3.



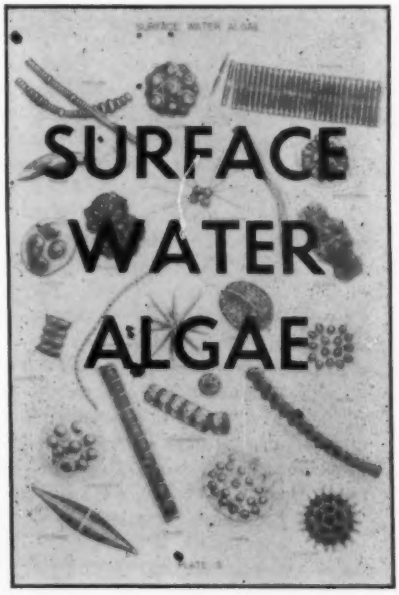
On Plate 4 are shown a number of species of algae which tend to develop in large numbers in clean water but are absent or much reduced in numbers in polluted portions of the stream. The term "clean water", as used here, refers to water which is relatively free of sewage. This clean water may be present in streams above sewage outlets or farther down the stream where the sewage has been changed to form relatively inoffensive salts and other simple compounds. Some of these products of sewage decomposition will stimulate algae to grow much more profusely than in the stream above the sewage outlet where the necessary nutrients are limited.

A large number of algae grows well in water containing partially decomposed sewage. It is difficult to select those which are the best indicators of the clean water zone since it is adjacent to the recovery zone where purification is still in progress. The clean water group includes several diatoms, several minute brown swimming algae, and a few fresh-water red algae in addition to certain greens and blue-greens. Several of them appear very small even under a microscope but they are better indicators of clean water than many larger algae that often are mixed with them. However, a few of the larger forms are useful in indicating the condition of the water and are represented on the chart by particular species of *Cladophora, Rhizoclonium,* and *Lemanea.*

Many of the indicator algae are floating plants which grow and multiply unattached in the water. Examples of these are the diatom, *Meridion circulare,* and the flagellates, *Phacus pyrum* and *Chromulina rosanoffi.* Other algae such as *Phormidium autumnale* and *Stigeoclonium tenue,* of the polluted water group, and *Cladophora glomerata* of the clean water group, are attached to the rocks or other material at the bottom or sides of the stream. *Chamaesiphon incrustans,* illustrated on Plate 4, is an example of an epiphytic type, i. e., one which grows attached to the surface of other plants in the water.

It will be noted that the binomial species name is used to designate each of these indicator algae. This is necessary because closely related forms having the same more general single word *genus* name, are often unlike in their reactions to sewage. For example, there are two species of the genus *Merismopedia* illustrated. *M. tenuissima* is included on the polluted water plate while *M. glauca* is on the clean water plate. Thus, two closely related forms of the same genus are indicators of contrasting stream conditions. It would be unwise, therefore, to designate these algae merely by their genus names.

Most of the algae individually are not reliable indicators of pollution or of clean water. It is only when several species of the polluted group or clean water group are found to be abundant that is possible to consider them as reliable indicators of the condition of the stream.



A reservoir is generally capable of supporting a large mixed group of aquatic plants and animals. Control of the reservoir in order to minimize any undesirable effects caused by the aquatic growths is often necessary. Plate 5 illustrates some of the common surface water algae, the "phytoplankton", which constitute a very significant portion of the aquatic flora. Many kinds of algae are found growing throughout the water. These are most abundant near the surface where the light is present in sufficient intensity to permit the algae to carry on their essential process of photosynthesis. Recent studies indicate that very minute algae and related forms greatly exceed in volume the larger microscopic forms. These very minute forms termed the "nannoplankton," are generally missed in the routine analysis of water in which only a low magnification with the compound microscope is used.

The open water algae have several mechanisms which aid in keep-

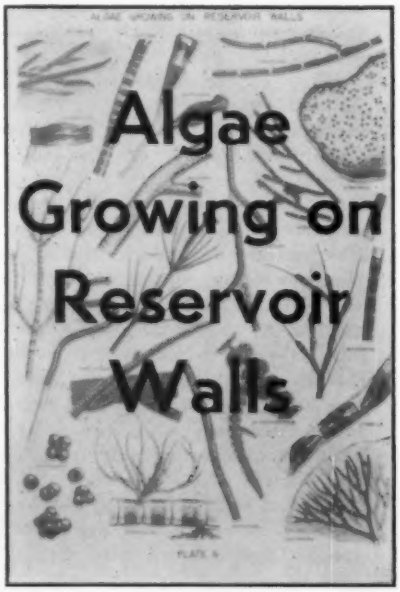
SURFACE WATER ALGAE

ing them dispersed in the water and retard any tendency toward settling out. The pigmented flagellates, represented by *Euglena, Phacus, Gonium,* and *Eudorina* are swimming forms. The spines or spine-like construction of the whole cells help to keep the green algae, *Actinastrum, Micractinium,* and *Scenedesmus,* suspended in the water while the large flat surfaces help in the case of *Fragilaria,* a diatom, and of *Pediastrum.* Forms with spherical or subspherical colonies of cells are illustrated by *Coelastrum, Oocystis, Gomphosphaeria,* and *Sphaeroocystis.* Filamentous forms include *Nodularia, Mougeotia, Zygnema, Cylindrospermum, Melosira,* and *Desmidium. Mougeotia* is a favorite food for certain aquatic insect larvae, which in turn are the favorite food of many fish. The diatom *Stauroneis* is boat-shaped and capable of moving through the water like a microscopic submarine. Soft waters may contain many desmids such as the *Euastrum* and *Stephanodiscus* shown on the plate. The odd-colored *Botryococcus* has its yellow-green cells embedded in a brownish mucilaginous sheath.

It is these unattached algae which constitute the bulk of the plankton counts that are made at many water treatment plants. So long as the total count remains low and no taste and odor algae nor filter clogging forms are present in conspicuous numbers, the water works engineer knows that he is unlikely to have serious difficulties with the algae. A reasonable number of common type plankton organisms of various kinds indicates a balanced biological condition in his raw water supply which will probably respond to treatment with the minimum of trouble. If one group, such as the blue-greens or the diatoms, or one particular species, such as *Microcystis aeruginosa* or *Synura ulvella,* begins to predominate, then he becomes alert for possible trouble and can treat for the control of algae before undesirable conditions develop. When blue-green algae become predominant, it usually indicates either that the water has been polluted with organic matter or that there has been a large preceding epidemic of diatoms.

In waters poor in nutrients the factors limiting the number of algae may be the amounts of food materials available, particularly nitrates, phosphates, and in the case of diatoms an additional substance, silica. Some localities are proposing to restrict the algal growths in the raw water supply by removal of phosphate, causing it to precipitate as ferric phosphate. In one of our western cities a problem condition developed when 20 percent of a ground water containing approximately 5 to 10 ppm nitrogen as nitrate was mixed with a relatively infertile surface supply, causing heavy growths of the green algae, *Golenkinia, Palmella,* and *Scenedesmus.* In England, the addition of ground water to a reservoir caused a copious growth of the yellow-green alga, *Tribonema.* The growths in some localities have been so rank as to necessitate withdrawing the reservoir from service. Many bodies of water are sufficiently rich in the essential nutrients that these nutrients do not become limiting factors in determining the abundance of algae. Other factors such as turbidity, water temperature, and parasitism may be the critical ones. Although it is assumed that the chemical and physical environment largely determines the amount of algal production, the exact relationships remain in many respects obscure.

A number of the surface water algae have the ability to accumulate, at times, in such numbers as to form a visible "bloom." Blue-green algae may form these water blooms particularly during periods of warm, calm weather when the algae, which have been distributed through the water, rise to the surface. Other blooms may be associated with a rapid reproduction of a particular kind of alga. Water blooms have resulted in fish kills by shutting out light necessary for photosynthesis in the lower areas, by using up the oxygen through decay and respiration or by the production of toxic materials. These materials are also extremely toxic to domestic animals and birds and extensive kills have resulted in several areas.



The sixth and final plate of algae illustrates small portions of filamentous and colonial algae which grow attached to solid objects such as the wet concrete walls of settling basins, the screens at the ends of the intake pipes or canals, and the wood or brick or even soil surfaces of reservoir walls and bottoms. In small amounts, these algae cause no alarm but when abundant they may become a decided nuisance in a number of ways. They may clog screens to which they are attached, reduce the flow in canals, interfere with other uses of the water, such as swimming or fishing, or develop such rank growths along the shores of the reservoirs that they are the cause of complaints from nearby residents. In addition they may break away from their attachments to form unsightly surface mats, to clog screens and filters, or produce odors and tastes in the water. Other forms produce a slimy and slippery layer on the concrete or other surfaces which in swimming pools is undesirable or even dangerous.

Many of the attached algae grow in the form of simple or branched filaments fastened at one end by means of a special anchoring device. Typical genera include the green algae, *Cladophora, Chara, Chaetophora, Stigeoclonium, Oedogonium, Microspora, Bulbochaete, Draparnaldia, Ulothrix,* the yellow-green *Vaucheria,* and the red algae, *Audouinella, Batrachospermum,* and *Compsopogon.* Certain diatoms such as *Achnanthes, Gomphonema,* and *Cymbella* are attached by means of gelatinous stalks or tubes. In 1940, in Australia, *Gomphonema* developed as an extensive growth

ALGAE GROWING ON RESERVOIR WALLS

PHORMIDIUM

SURFACE WATER ALGAE

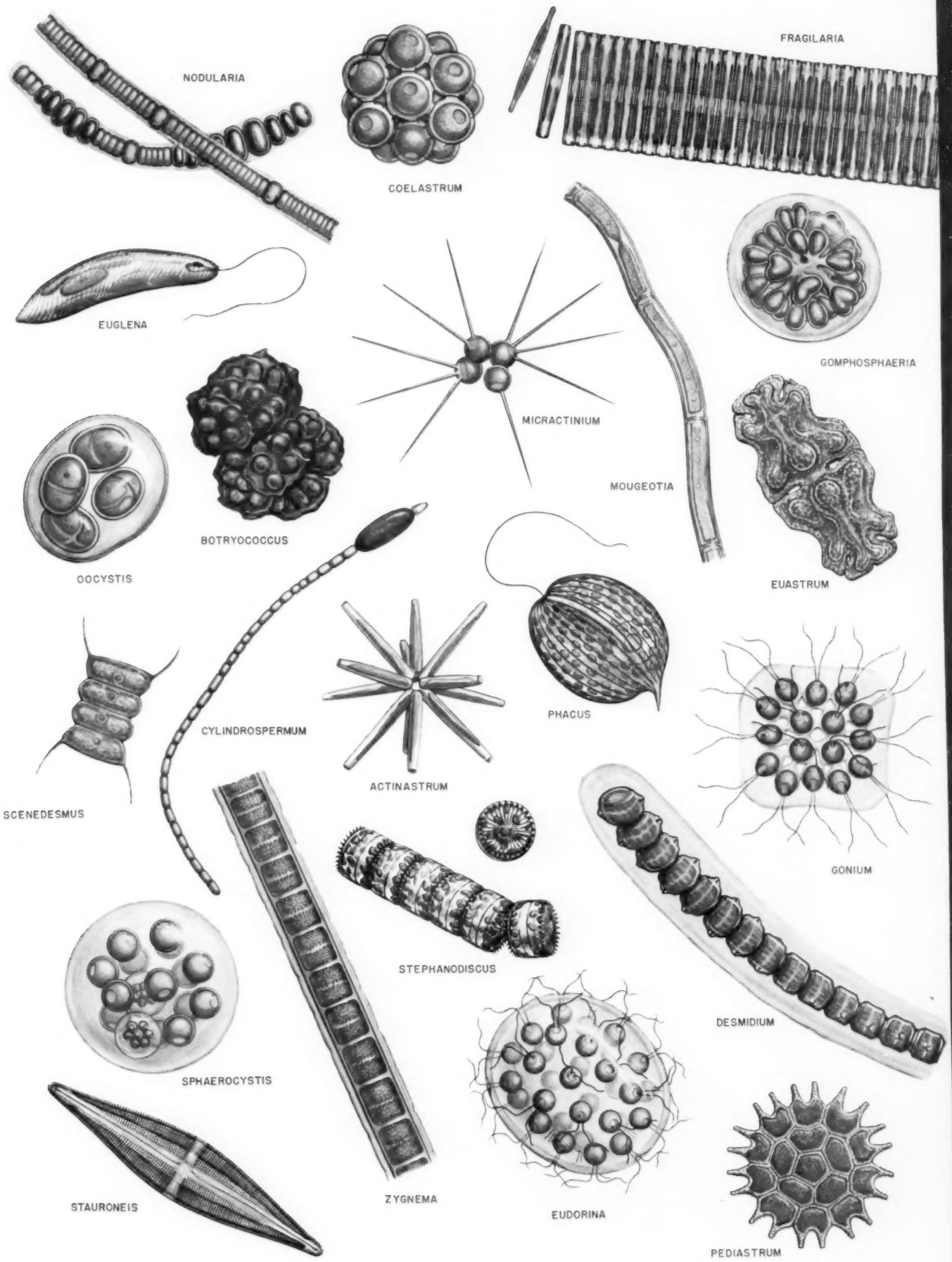


PLATE 5

ALGAE GROWING ON RESERVOIR WALLS

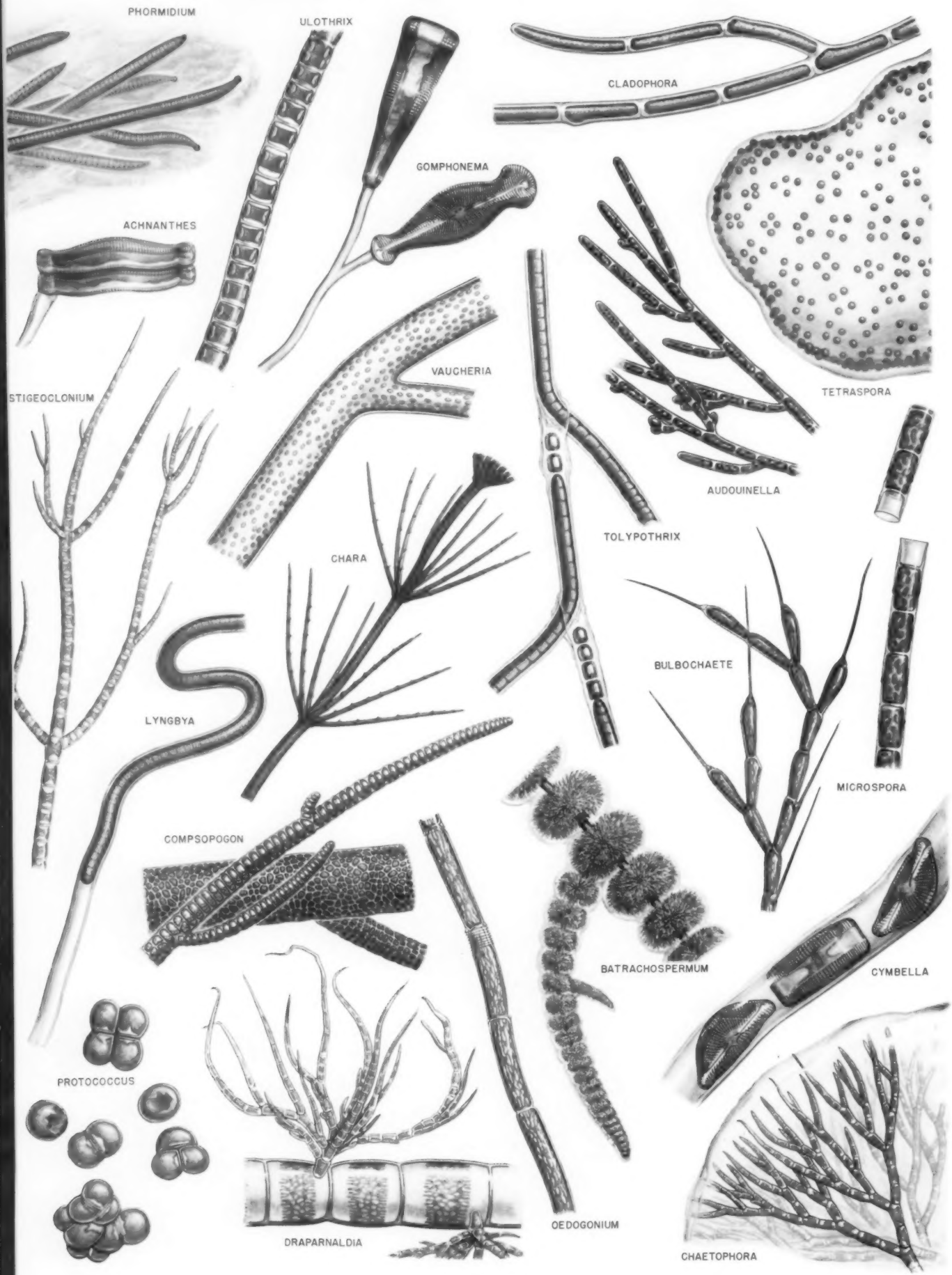


PLATE 6

and formed a slippery felt-like mass covering the cement walls of an aqueduct for several miles.

Certain blue-green algae such as *Phormidium, Lyngbya,* and *Tolypothrix* form mats, one side of which is attached to the stone or other surface. *Tetraspora* is composed of minute cells in a common soft sack-like mass of mucilage attached at one end. Finally *Protococcus* is common on the surface of moist wood and bark.

Drastic measures often have to be taken to control these algae, especially since they are generally neglected until large quantities threaten to cause trouble. The use of chemicals to kill algae when they are present in quantity may not solve the problem since dead algae as well as living ones may clog filters and screens, release slimes into the water and cause tastes and odors. Kansas City, Kansas, adapted a floor-cleaning machine fitted with a cylindrical wire brush for use in scraping the algal growth from the concrete floor of a thirteen million gallon reservoir. The machine proved to be much more effective than hand scrapers in removing the attached portions of the algae from the more than 100,000 square feet of concrete. The detached algae were flushed from the reservoir by streams of water from fire hose.

CONTROL OF ALGAE

In the past, algicides have generally been used to destroy all algae present in the water. Scientific control of algae in reservoirs requires a knowledge of the potential nuisance value of each important species together with procedures for early selective treatment to prevent the undesirable species from reaching the troublesome stage. This needs to be done in ways which cause the least disturbance to other organisms so that a chain of undesirable reactions is not initiated. For example, an open reservoir gave comparatively few problems from algae over a period of years until chlorine treatment was begun for control of bacteria. The chlorine eliminated a mixed growth of algae, upset the biological balance, and the reservoir became subject to sudden blooms of chlorine resistant algae, particularly *Chlamydomonas* and *Cosmarium,* which were difficult to control and to exclude from the distribution system.

The use of copper sulphate to kill algal growths also may merely change the prodominating growth from one kind of alga to another owing to the fact that there are species of algae which are resistant to this chemical. Destruction by copper of one species of alga may be followed by growths in the reservoir of some other species, usually the smaller green algae. *Ankistrodesmus, Chlamydomonas, Crucigenia, Oocystis, Pediastrum, Scenedesmus,* and *Tetraedron* are particularly likely to occur and may increase rapidly in water with a copper sulphate concentration of half a part per million. These smaller algae which develop after treatment with an algicide may then get into the distribution system and be the cause of complaints from consumers.

The growth of algae is dependent upon a number of factors which must be known for the particular body of water under consideration if a satisfactory control of the algae is to be achieved. Many of the critical environmental factors appear to affect the algae not at the time of the heaviest growth, but in the earliest stages of that growth. This means that these factors would have to be recognized about three to eight weeks before the heavy growths appear. For example, British workers observed that if the silica content of the water falls below 0.5 mg. per liter in the spring, no abundant growth of diatoms is likely to occur during the next few weeks. It is obvious, therefore, that frequent samplings and analyses should be made throughout the year in order to detect potential blooms of nuisance algae.

BENEFICIAL EFFECTS OF ALGAE

Algae may produce beneficial effects in water treatment since they aid in the removal of bacteria and colloidal and soluble organic matter during the process of coagulation or of slow sand filtration. Thus, their complete extermination previous to the time the water enters the treatment plant may be undesirable.

Some of the other beneficial effects of algae in water have been referred to in the references to release of oxygen in the water. It is well to emphasize also, that the algae, directly or indirectly, serve as food for fish and other aquatic animals of importance to man. Some of the smaller varieties of fish and many other small aquatic animals use algae directly as food. These, in turn, are used as food by the larger aquatic animals. It is, therefore, a common practice to add fertilizers to fish ponds in order to stimulate the growth of algae which serve as the base of the food chain. Communities of the filamentous algae may also serve as nesting places for the young of fish, aquatic insects, worms, and other fish food organisms. The right balance between the plant and animal populations in the water must be maintained, however, if cooperation rather than competition between the two is to be continued. The covering of the water surface by algal mats is a frequent cause of fish kills because these mats shut off the sunlight essential for photosynthesis in the deeper layers, prevent reaeration by wave action, and use up oxygen by their decay.

LITERATURE ON ALGAE IN WATER

Reliable and fairly comprehensive accounts of the algae important in water supplies are few in number. There are two recent pamphlets which contain a wealth of helpful information. These are "The Effects of Algae in Water Supplies," prepared for the 1952 Congress for the International Water Supply Association, by D. H. Matheson of the water filtration plant at Hamilton, Ontario, Canada; and "Freshwater Biology and Water Supply in Britain," by W. H. Pearsall, A. C. Gardiner, and F. Greenshields, published in 1946 by the Freshwater

Biological Association of the British Empire. Both of these are already reported to be out of print. The one comprehensive book on the subject is "The Microscopy of Drinking Water," by G. C. Whipple, G. M. Fair, and M. C. Whipple, which has been published in several editions and printings between 1899 and 1948. A host of other literature deals with various phases of the subject and a number of pertinent articles are listed below. It has become evident that a comprehensive, concise, practical manual on algae important in water supplies is needed. The six plates of algae together with this brief account, are presented here to help fill the gap until the more complete manual which is in preparation by the Public Health Service becomes available. The color plates of algae will also be included in the manual, copies of which will not be available until after notice of publication.

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About the Authors

Dr. C. Mervin Palmer is head of the Nuisance Organisms Research Unit of the Water Supply and Water Pollution Control Program at the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. He is an algologist and is author of articles on the culturing, control and taxonomy of fresh-water algae. Dr. Palmer is a member of the Task Force on Biological Infestation of Purified Water of the American Water Works Association. He taught and directed research on microbiology and botany at Butler University from 1925 to 1950. In cooperation with the late C. K. Calvert, Dr. Palmer made an extensive study of White River phytoplankton in relation to the sewage effluent at Indianapolis, Indiana. While in India, he served as Field Science Officer for the UNESCO Science Cooperation Office for South Asia. He is a graduate of Pennsylvania State University and Indiana University and majored in agronomy, botany, plant pathology, and algology.

Dr. Clarence M. Tarzwell has served for the past six years as Chief of Aquatic Biology at the Robert A. Taft Sanitary Engineering Center. Previous to joining the Center staff he served with the Communicable Disease Center of the Public Health Service at Savannah, Georgia, with the Tennessee Valley Authority, the U. S. Forest Service, the Bureau of Fisheries, and the Institute for Fisheries Research of the Michigan Department of Conservation. He is a graduate of the University of Michigan and the author of numerous scientific papers. His studies have covered a broad field and include investigations of the role and value of aquatic populations for indicating pollution, rodent and ectoparasite control studies, residual spray investigations, studies of the effects of various insecticides on aquatic life, the management of impoundments for fish life, and the development of trout stream improvement methods.

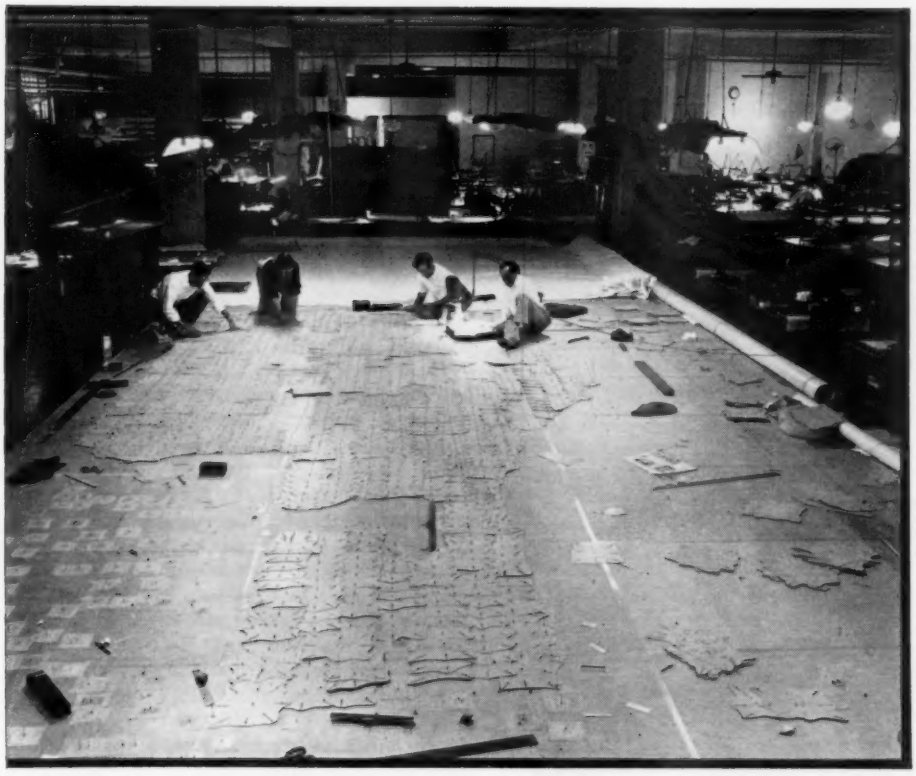
Harold J. Walter is the artist-biologist responsible for the six plates of colored illustrations of the algae important in water supplies. He is a graduate of Ohio State University and is at present a graduate student in zoology at the University of Michigan. His training in art was obtained at Ohio State University and at the Dayton, Ohio, Art Institute. In 1948, he was staff artist for the Virginia Fisheries Laboratory. Previous to his present work, he served as a biological aid at the Robert A. Taft Sanitary Engineering Center.

Reprints of this article with color plates are available from PUBLIC WORKS. See page 169 of this issue for order form, cost data and other details.

AERIAL PHOTOMAPPING

as applied to Public Works

● KELSH plotter on tracing table.



● CARDBOARD templets are used for locating photogrammetric control points.

BERNARD J. COLNER

THE famous inventor, Alexander Graham Bell, sent tetrahedral kites aloft with cameras to take aerial photographs. Since then interesting physical features of the earth's surface have been detected by such photographs—sites of Indian mounds in the Ohio Valley and craters on the Carolina coast caused by a swarm of meteors. And of interest to local engineers, a large tract of land in the West, never recorded on any assessor's books, was found when air photographs were compared to existing tax maps.

Aerial photographs are extremely detailed maps or, at least, are excellent sources for them. Even roadside mailboxes and their shadows can be spotted from photographs taken from two miles up in the air. Pasture, timber, water, and cultivated places are shown in their true sizes and shapes, and in their proper relation to each other and to other properties in the vicinity.

Mosaics are photographic maps of terrain made by combining two or more vertical photographs. When care has been taken, a mosaic map serves as a reasonable substitute for a regular topographic map for areas that are not too hilly. In some cases the photographs are rectified by changing the scale for a better match and for obtaining a more or less over-all familiar scale. An efficient mosaic should be at the same scale as that of the map used by administrators and planners.

In making uncontrolled mosaics, photographs are matched as well as possible. In laying a controlled photomap, horizontal control is needed for the best possible placement, whereas the matching of detail is secondary. Grid lines, names, and any other notation desired to be reproduced on the mosaic should be inked on the original. The legend which contains the appropriate title, graphic scale, and the true, magnetic or grid north arrows should also be included.

It is preferable to take the photos when the sun is high and thereby avoid long shadows. Sometimes the season of the year is important to bring out desirable detail. For topographic mapping the leaves should be off the deciduous trees; and a very light snow on the ground makes for optimum exposures. In studying large scale photographs, shadows are important and they should fall toward the viewer in order to see the natural effect of relief, otherwise a pseudoscopic effect may be the result. Under the latter condition the valleys may be seen as mountains, and mountains as valleys. It is wise to examine stereograms of wide-angle photo-

● 3D EFFECT is obtained by using simple stereoscope on aerial photos.

graphs looking from the middle of each photograph outward to the border. Stereograms are made of a pair of overlapping photographs taken from different perspective centers. Shadows help to point up the location of elevated objects such as radio towers, water tanks and spires.

Photograph Sources

Commercial companies and government agencies are sources for aerial photographs. Vast areas of the United States have been covered; in fact some states have been entirely photographed by the various government services. A rundown of some of the larger aerial mapping outfits to contact for air photographs follows: Fairchild Aerial Surveys of Los Angeles; Hycon Manufacturing Co. of Pasadena, California; Geophoto Services of Denver; Alster & Associates of Washington, D. C.; Air Survey of Arlington, Va.; R. M. Towill of Honolulu; Chicago Aerial Survey Co., Chicago; Park Aerial Surveys, Inc. of Louisville, Kentucky; Abrams Aerial Survey Corp. of Lansing, Mich.; Mark Hurd Mapping Co. of Minneapolis; Robinson Aerial Surveys, Inc. of Newark, N. J.; James W. Sewall of Old Town, Maine; Lockwood, Kessler & Bartlett of Great Neck, Long Island, N. Y.; K. B. Wood & Associates of Portland, Oregon; Pennsylvania Aerial Survey, Inc. of New Cumberland; Aero Service Corporation of Philadelphia; Robert A. Cummings, Jr. & Assoc. of Pittsburgh; Michael Baker, Jr., Inc. of Rochester, Pa.; International Airfotos Inc. of Nashville; Jack Ammann Photogrammetric Engineers of San Antonio; Texas; and Donald J. Belcher & Associates of Ithaca, N. Y.

● AERIAL views can be of tremendous help in analyzing actual conditions.

For an index of available photographs that can be furnished by Federal agencies, write to the Map Information Office, U. S. Geological Survey, Washington 25, D. C. After all these sources are exhausted, it may be necessary to engage aerial photographers to fly the desired area. The advantages for the latter procedure include having the latest photography, special spots can be pin-pointed and the altitude and flight lines controlled as wanted.

Highway departments should have the services of a photogrammetric engineer. After terminal points for a new highway have been selected, the task of location and design begins. Aerial photography will be extremely important for the analysis of the following stages: reconnaissance of the area for selection of possible alternate routes; reconnaissance of alternate routes and comparison with each other until the best is selected; the preliminary location survey; and the design of the final route. By photogrammetry, maps are produced faster and at much less cost than by conventional field methods. An air surveying concern produced a series of maps of a 150-mile extension to the Pennsylvania Turnpike in 145 calendar days at the scale of one inch equals 200 feet with a five-foot contour interval. The total cost was less than $1.00 an acre and much of the map was in fairly heavily populated area.

In Los Angeles, realtors are faced with a deadline of a thirty-day option period. Property therefore must be mapped, subdivided, and approved by the Los Angeles Planning Commission within that time limit. The Engineering Service Corp. found that in rough or rolling country they were able to prepare accurate topographic maps within one week of an area of seventy acres at a scale of one inch equals 100 feet with a five-foot contour interval. The work was done on Bausch & Lomb Multiplex Equipment which is a stereophotogrammetric projector system utilizing reduced positives on glass (diapositives) made from aerial negatives.

The Town Engineer of Port Hope, Ontario, wrote of his experiences with air survey maps which he found to be most valuable in planning the location of sewers in a hitherto underdeveloped section of his city. It was through the photogrammetric process that a section of Port Hope, originally thought too remote, because of high servicing costs, was found to be profitable for development.

In Washington, D. C., a board of directors thought it would be nice to have a fairly large scale photograph of their cemetery enterprise. To their collective surprise and joy, they discovered a rather large tract of usable area which was subsequently laid out for cemetery plots. That small investment in a photograph paid off handsomely.

Roads which have been abandoned for years are revealed on air photographs. These roads often could never have been seen on the

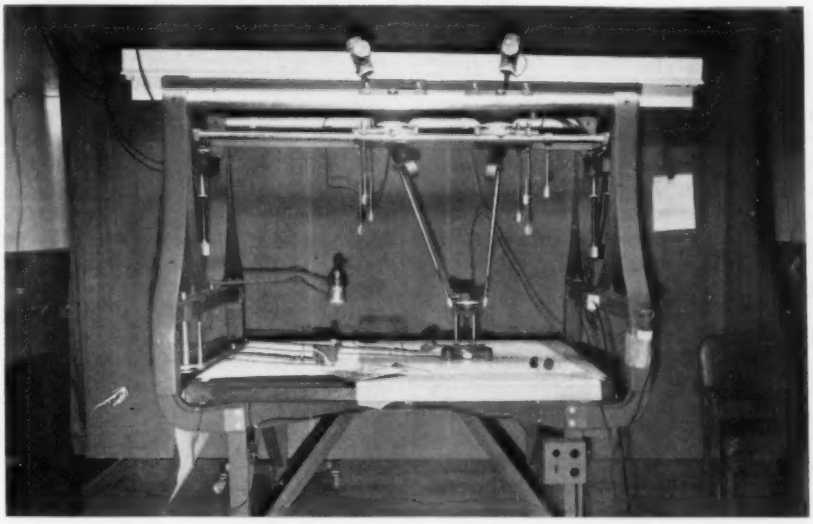
ground and such important information is essential in preparing Road Docket Indexes which show the location of roads petitioned for, approved, disapproved, located, relocated or, as in this case, abandoned.

Air photographs have proved themselves to be excellent sources of revenue. Tax assessors are forever vigilant in tracking down non-assessed acreage and thereafter make sure this appears on subsequent tax rolls. Corrections are made in assessments since old deeds of farm lands were notorious in short-changing acreage of farm lands by about 20 percent. These photographs obviate the necessity of costly and time-consuming field surveys in the investigation of very poor descriptions of acreage owned by governmental agencies.

Electrical engineers are always on the alert in the location and design of reservoirs and the consequent need for access roads and transmission lines. The civil engineer must locate and design highways, railroads, water lines, storm and sanitary sewers, airports, and industrial plants wisely. The city planners are burdened with the problems of zoning, thoroughfare systems, recreation sites, and housing developments. The mining and petroleum engineers, the hydrologist, and the forester all need information for access roads, rail spurs, spoil dumps, location of oil and gas wells, tanks, pipe lines, power lines, flood aspects, timber typing and inventory, etc. These engineers require an intelligent basic source of information, namely, aerial photographs and their photogrammetric products: ratio prints, mosaics, and topographic maps.

Thomas B. Ray of New Rochelle, N. Y., wrote of the many uses for the aerial topographic (one inch equals 200 feet scale) maps compiled for his city. He told of how new designs for sanitary sewer and storm drain facilities were drawn up on the basis of these maps. There was no longer any need for tedious ground surveys for each contemplated sewer or drain job. There could now be speed in urgent public works. Previous maps were only planimetric with "official" widths or "paper" streets depicted on them. The Bureau of Parks, Docks and Harbors were interested in these air surveys because of the need for knowledge concerning waterfront improvements, dockage facilities, mooring areas, extent of marginal land, and location of bulkheads and seawalls. The architectural engineer could now develop the city more esthetically and plan more judiciously for the new city hall and station plaza utilizing these accurate topographic maps.

Dean Smith of Mesa, Arizona, cites the values of the aerial photography contracted for his city. Seventy photographs (scale of one inch equals 200 feet) were mosaicked in four parts on masonite and were used for street location and design, including alleys; property assessments; zoning and planning (to prevent non-coordinated laying out of streets and residential areas); industrial location; slum clearance; Fire and Police Departments; garbage disposal; and parking concentrations. Mr. Smith pointed out, in stressing "public relations", that citizens could present problems and complaints in a clearer manner based on these mosaics. The layman, as well as the engineer, find aerial photos or mosaics easier to read than maps. There is always the plethora of detail on the mosaic. Familiar landmarks seen on the photograph in the form of a lone tree or bush, stone, stream, trail or something similar, awaken a strong familiarity with any area under discussion. Thus it can be seen how well air surveys fit into public works engineering projects. Not only do they save money but they save time and they can be important factors in public relations.



● **TRACING table of one of latest stereoinstruments, the Kelsh plotter.**

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CONTROLLING Sewage Plant Odors

JOHN N. LESSLIE, Chemist & Supt. of Plants, Salisbury, N. C.

POSSIBLY the most frustrating job connected with the treatment of sewage is that of controlling odors emanating from the plant. The entire process of sewage treatment is a potentially odorous undertaking, and treatment will be accompanied by odors unless every precaution is taken to eliminate them.

This problem of odor has always been with us to some extent, but is becoming more accentuated now for several reasons. An increase in population and land values has resulted in an increase in residential building on the outskirts of our towns and cities. Since most sewage plants are located within two to five miles from the city limits, they have been surrounded by this residential growth. Then, too, more complete treatment of sewage and waste is being required. This means that more solids are being removed that must be handled at the plant, and that the sewage is held longer and agitated more than in the simpler primary plants of the past.

In an effort to improve our effluents we have run right smack into the hazard of fouling up the atmosphere.

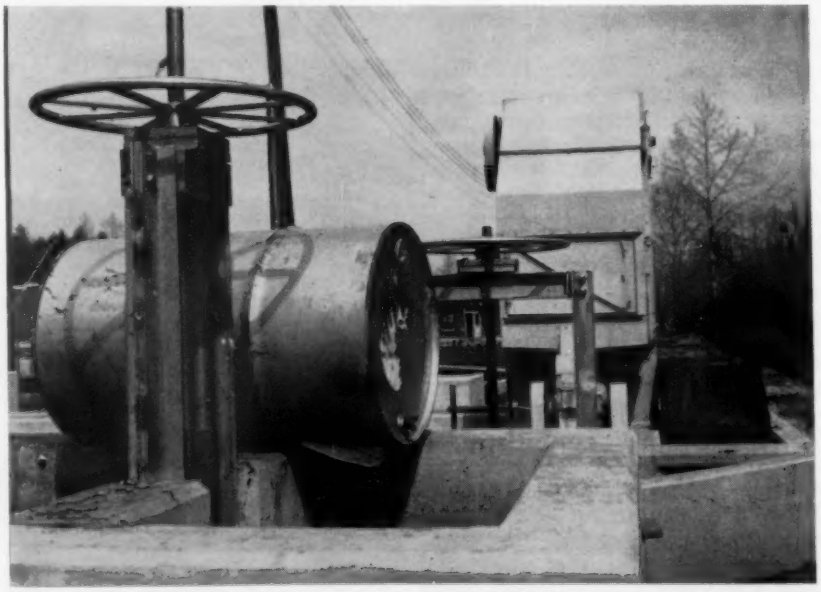
That is the situation at Salisbury. One of the first questions we are asked by a complainant is "why is it that we were never bothered by odors from the old plant? You have spent $250,000 and generated a nuisance."

The only answer we can give is that raising the treatment efficiency from 30 to 90 percent has taken the load off the river, but has greatly increased the odor potential of the plant. We are keeping it instead of dumping it.

We are unfortunate at Salisbury in that we have residential developments on three sides of our plant, and the wind never blows toward the fourth side. Any odors generated at the plant become immediately apparent to our neighbors.

Prior to remodeling, the plant was of primary design, with provisions for settling and separate sludge digestion. Additions to the plant, completed in April 1954, consist of a Chicago Pump degritor, a Link Belt bar screen with grinder, a Door flash mixer, a Process Engineers Oxidator, and a high rate bio-filter with Pacific Flush Tank distributor. These units were inserted ahead of the old plant, with the old settling basin serving as a secondary unit.

The plant was designed as a pilot unit to treat 2 mgd of combined domestic sewage and textile wastes, with provision for chemical pretreatment ahead of the bio-filter. Chemical feeding is handled by two flow controlled W & T Merchen feeders. The Oxidator unit, used as a primary clarifier, is of circular design, 70 feet in diameter, and with provision for aeration up to 400 cfm in the central portion. This aeration was to be utilized as a flocculating aid, but its use as such has been unsuccessful due to a heavy carry-over of settleable solids when chemical pretreatment was used. The bio-filter is 125 feet in diameter, or approximately 12,000 sq. feet in area. Pumping facilities are provided to give up to a 5 to 1 recirculation ratio at the rated flow, and we are using the maximum rate obtainable. The waste treated is a strong composite of dye waste and sewage with BOD ranging as high



● FIG. 1. This was the setup for the experimental phase of feeding Orthosolv. A 55-gallon drum, feeding through a stop cock, was placed on the grit chamber.

as 600 ppm. A great portion of the dye waste consists of sulfur blacks and blues that are very difficult to treat.

Chemical Pretreatment

The choice of chemical pretreatment was based on work done in our laboratory and on additional investigation by Dr. Nelson Nemerow of N. C. State College. Support for the choice was found in the reports of previous investigations under the sponsorship of the Textile Foundation.

Shortly after starting the plant it became apparent that we were to be plagued with odors of every description and from many sources. The most serious odor, though, was that of the hydrogen sulfide generated by alum coagulation of the sulfur dye wastes.

Pre-design study had indicated that close control of the pH of the reaction at 7.0 would minimize the evolution of hydrogen sulfide, and that fair coagulation could be obtained. In the plant it was found that the pH was very critical, and that a drop to a pH of 6.6 resulted in serious hydrogen sulfide odors. On the other side, an increase to a pH of 7.2 resulted in no "floc". Since the pH of the incoming sewage varied widely and rapidly from 7.0 to 9.8, control to this precision was impossible with the equipment at hand.

A recording pH meter on the effluent of the primary clarifier showed a fairly uniform pH, but this equalization took place in the clarifier after the damage was done.

● **HIGH RATE filter in operation at the Salisbury plant. Distributor is PFT. Note method of trickling filter construction with stone rising above level of filter walls.**

Hydrogen sulfide was generated in that portion of the flow having a pH of less than 6.8, and was discharged to the atmosphere before equalization. Use of 200 cfm of air in the Oxidator as a flocculating aid really spread this odor around the neighborhood.

In addition to this hydrogen sulfide odor, we were plagued by other odors more common to sewage treatment plants.

At summer temperatures the sewage arriving at the plant borders on septicity, and the increased detention time provided in the plant increases the odor potential from this source. At night, when flows are the lowest and the atmosphere is heavy, the valley was saturated with septic odors.

Another contributor to the general odorosity was the supernatant from the digesters. This supernatant is returned to the primary mixing chamber, and goes from there to the Oxidator. The extremely heavy load of chemically precipitated sludge on the digesters resulted in a poor quality supernatant, high in BOD and high in odor. This contributed its share to the generally anaerobic conditions prevailing in the Oxidator, and materially added to the deterioration of our public relations.

Orthosolv to the Rescue

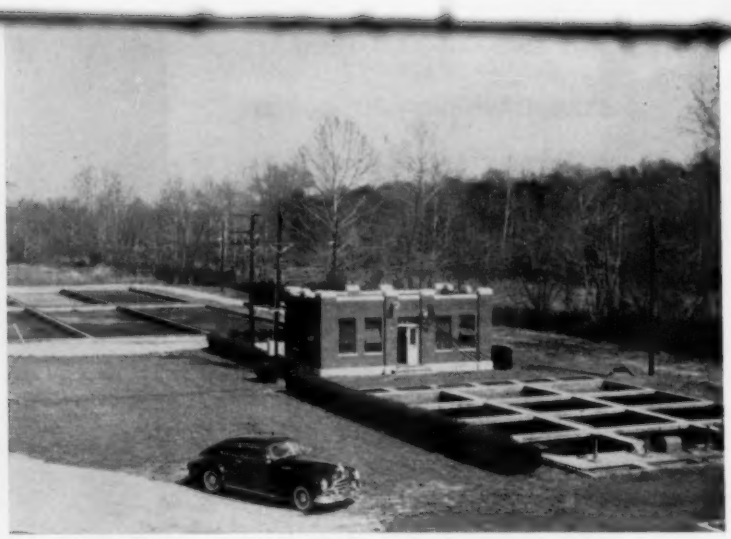
Many things were tried in an effort to reduce odors from the plant. Some progress was made along the line of general cleaning up, but the odor level remained high enough to elicit complaints from our neighbors, especially at night. We were rapidly becoming discouraged when we heard about ortho dichlorobenzene. This material, as used at Salisbury, is manufactured by Solvay under the trade name "Orthosolv", and is emulsifiable with water. The current price is around $2.30 per gallon in drum lots.

Immediately after starting the use of the Orthosolv, we achieved relief from the majority of our odor troubles, and have been able to handle all of the spot odors that have cropped up from time to time. The material seems to be a specific for hydrogen sulfide, and does an equally good job on septic odors, though not as dramatic.

Feeding is very simple. Figure 1 shows our experimental set up, in which a 55 gallon drum was used. The drum was fitted with a stopcock of the type used on oil drums, and set up on the grit chamber hopper so that the emulsion could drip directly into the incoming sewage. In making the emulsion, we placed from 2 to 5 gallons of Orthosolv in the drum, then filled it with water. It is im-

● **FILLING digester pressure relief trap with Orthosolv controlled digester odors.**

● **PRIMARY clarifier and chemical building. These are new units of the plant, completed a little over a year ago.**



● **SECONDARY clarifier is in the foreground. Also shown here are the chlorine building and the sludge drying beds.**

portant that the water be added to the "Orthosolv" and not the "Orthosolv" to the water. A much more stable emulsion is obtained by the former procedure.

The dosage is controlled partially by the amount of concentrate used, and partially with the stopcock. Complete control with the stopcock is not practical because of stoppage of the cock when it is more than two thirds closed. This is caused by a jelly formation that is especially bad at low temperatures. This fact may make feeding of the emulsion with gravity flow feed impossible in colder climates.

Our permanent installation will consist of a mixing tank with mechanical mix, and a proportioning type pump. We believe that this will overcome the stoppage problem.

We have obtained good results on septic domestic sewage with a dosage of 2 ppm of the concentrate. On sulfur dye waste, coagulating with alum at a pH of 6.4, we have eliminated the hydrogen sulfide odor with a dosage of 4 ppm of the concentrate. Based on a price of $2.30 per gallon, the cost has averaged between $5 and $7 per million gallons.

Side benefits have been derived. Grit removed from the grit chamber is no longer a nuisance to handle, and the screenings are deodorized to a great extent. There has been no deleterious effect on the filter growth, and no apparent increase in BOD in the effluent. A good bit of the "Orthosolv" is adsorbed by the sludge and is removed with it. No interference with digestion has been observed, but the characteristic odor of the material is noticeable around the digesters, and has aided, to some extent, in reducing the odor from the supernatant.

Very little of the material reaches the secondary settling basin, and if troubling odors occur at this point from larvae and other washings from the filter, additional treatment will be necessary.

Continuous feeding of "Orthosolv" has not been found necessary. We use it only when needed. Alum coagulation of sulfur dye waste, of course, necessitates continuous feeding regardless of the time of day or year, but with other sewages, we have found it possible to achieve a substantial saving by selective feeding. The temperature of the sewage, temperature of the air, relative humidity, wind direction and velocity, and character of the sewage are all governing factors as to the necessity of deodorizing.

Odor Experiences

Our experience has been that, next to the character of the sewage, the difference in temperature of the air and sewage is the most important single factor. Any time the sewage becomes warmer than the air a series of unhappy events occur. First, the moisture demand of the air is increased and is satisfied at the air-sewage interface, the air becoming saturated with odor-laden water. At the same time the air along the interface is warmed, and convection sweeps it upward and away, bringing more cool air into contact with the sewage. Continuing this cycle for an hour or so results in a fog that covers the plant and neighborhood. Agitation of the sewage, such as by aeration, increases the odor exchange.

This temperature relationship is a common occurrence at night in both summer and winter. In the winter the average temperature of the sewage is low enough that septicity is virtually eliminated, and there is no odor to be picked up unless we put some there by drawing supernatant. By stopping supernatant withdrawal at night, we have eliminated the need for deodorizing domestic sewage during the winter except under rare conditions.

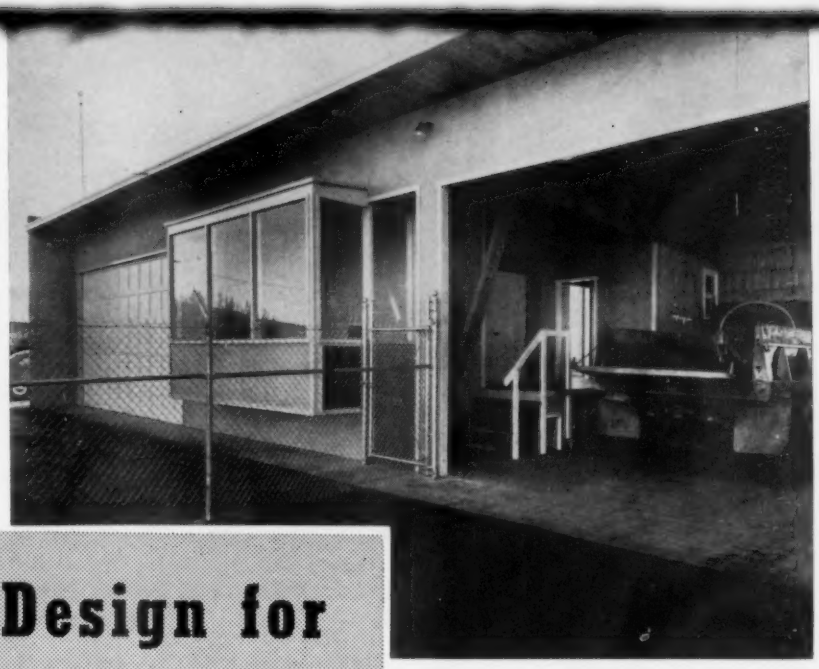
In the summer, though, when the sewage temperature is high and the sewage is septic, continuous feeding of "Orthosolv" is generally required at night; but, even in the summer, it is possible to discontinue or greatly reduce the feed during the daylight hours on many days. On warm, dry, cloudless days what odors do get into the air are carried upward and dissipated without causing complaints.

There is, therefore, no hard and fast rule governing the frequency or degree of deodorization. The one rule we have is: "If it smells, deodorize." Our operators have become very odor conscious, and are instructed to circle the plant during their shifts, looking for odor. Our experience has been that, if the plant has an odor, it will be detectable at the plant, and, conversely, if an odor is detectable at the plant, there is a good chance that someone else is smelling it too.

One word of caution is in order. Do not overfeed "Orthosolv". Ortho dichlorobenzene has an odor of its own. While it is not bad or repulsive in any way, it can serve as reminder to your neighbors that the sewage plant is there. What we want them to do is forget it exists. If we were feeding Chanel No. 7 or Jack Daniel No. 11 it would cause trouble. Someone in the neighborhood wouldn't like it and would tell us so.

One saving feature is that the odor dissipates fairly rapidly, and a considerable excess is required before it becomes noticeable at any distance from the plant. Usually, when our neighbors call about the "Orthosolv" odor, they are still

(*Please turn to page* 128)



● **SIDE VIEW of the Solano County Highway Maintenance Building, showing the bay window provided for better visual control of activities in the maintenance yards and repair shops.**

Functional Design for a County Highway Maintenance Building

K. R. MacDONALD

THE men who make up the crews of the Solano County Road Commission, in the northern part of California, are called upon to maintain hundreds of miles of roads and almost as many drainage structures. They work at completely unpredictable hours and under extreme variations of circumstances and of weather. To facilitate their work, W. A. Jones, Road Commissioner for Solano County, has constructed a road maintenance yard and headquarters building, which are designed with an awareness of the difficult conditions under which the men work and the strain placed on the Commission's equipment.

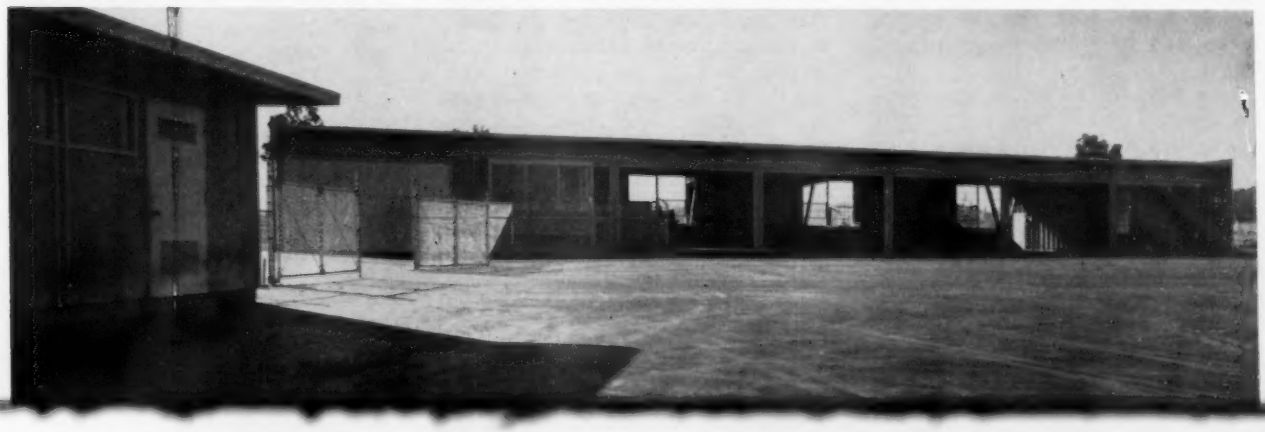
The Solano County yard, at Vacaville, half-way between San Francisco and Sacramento, the state capital, is a radical departure from most corporation yards and county road maintenance buildings which are of the step-child variety. Most such buildings just grow without any advance planning or attention to function. Few such buildings have ever felt the influence of an architect and most are constructed by the yard crews of the District which operates them.

Not so the Solano County yard. Jones took the unusual step of insisting that the yard and its buildings be designed by an architect and that they be built by private builders rather than his own crew. "When it comes to the maintenance of roads and drainage structures," Jones explains, "we can do a pretty fair job because of our experience and our skill in this particular field. But to produce a yard and a set of buildings efficiently designed to be completely functional in meeting our year around needs, we felt that we should go to an architect." The architect chosen was the San Francisco architectural firm of Bolton White and Jack Hermann, while the contractor was the Pacific Company Engineers and Builders of Berkeley.

The first problem on which White, Hermann and Jones worked in close collaboration was the selection of a site. The location finally chosen, on a county road leading out of Vacaville to the West, was selected because of its complete accessibility for the supervisory district. It is on a flat gentle slope and is a long, triangular site of about ten acres with approximately four acres devoted to the actual enclosed site of the yard and the buildings. The site was filled to develop a firm base and a slope for adequate drainage.

"One of the first major benefits we received from retaining an architect for the job," Mr. Jones says, "was related to economy. We wanted to save as much money as

● **ENTRANCE to Maintenance Yard and to Maintenance Building. Roll-up door outside entrance fence gives additional access.**



● **INTERIOR view of maintenance building in use with trucks being serviced.**

we could, yet the site consisting of adobe soil and fill raised many complex and possibly expensive problems. The architects, however, finally determined that the use of piles rather than continuous foundations or piers would be most economical and would provide a flexibility of design that would permit us to use the same type of building structure in the other four road districts of the county."

The buildings were to be used for servicing the road maintenance equipment and for the storage of county election machines. This use demanded a simple, unfinished type of construction. Thus the floor is merely an exposed concrete slab, except for the office section which is raised on a wood floor. Raising this section added to the comfort of the men who use the office rooms as a refuge during stormy weather. At the same time it provides a visual control over what goes on in the shop and the yard.

To keep construction costs at a minimum, the building is of prefabricated masonry panels manufactured in sections which are bolted together.

The general site planning, location of pumps and oil house, storage spaces and material stock piles were all determined on the basis of actual "use" studies. Thus the men find that their work is constantly made easier by the proper location of materials, equipment and tools.

One bay, for example, was completely enclosed to form a protected work-shop and working space with a lift for the trucks, compressed air for the lift and other tools used, and electrical outlets for welding equipment. Another bay was enclosed for the storage of election booths. This area is remote from the active working portion of the building inasmuch as need for entering it arises only at election time. The store room, locker room and toilet rooms are all located immediately behind the office where they are readily available to the road crews.

For a total construction cost of $30,900, the County obtained 4,620 square feet of usable space in the maintenance building, plus an additional 288 square feet in the adjacent oil house. Thus the construction cost amounted to the amazingly low sum of $6 per square foot.

The lubrication and shop bay has 660 square feet, the same area as the office portion and the storage rooms used for keeping election equipment. The largest area is the shop portion devoted to storage and servicing of road maintenance equipment. This portion has 2,640 square feet.

The interior was kept unfinished, except for the use of plywood in the office. It was considered unnecessary to finish off the interior because of the nature of the work that takes place inside the building. However, the building was furnished with comfortable chairs and furniture for the use of the crews which work out of the district.

Walter Parker, County Administrative Officer, and D. A. Mowers, Chairman of the Solano County Board of Supervisors, agree that the new architect-designed Vacaville yard has "returned dividends to the county in greater efficiency on the part of the workmen who use it. We will use this same design in the other four road districts where maintenance yards and buildings of this kind must be constructed. It has proved itself in the Vacaville operation and we are convinced that it's better to start with a good design that to use the old fashioned method of just building."

Sewage Plant Odors

(*Continued from page* 126)

running a fever, but the blood has gone from their eyes.

In addition to feeding "Orthosolv" into the sewage flow, we have used it in other applications about the plant. Spot odors are effectively controlled with it. Grit and screenings accumulations are sprinkled with the concentrate. After sprinkling and air drying, the grit is distributed on the yard. We anticipate a luxurious growth of grass.

It has not been necessary so far, but, if the sludge drying beds ever give trouble, we will sprinkle them too.

One odor that gave us a particularly rough time, until tracked down, was an intermittent gas discharge from the pressure reliefs on the digesters. These units are equipped with relief valves to release excess gas before the covers tilt. This intermittent discharge resulted in complaints, especially at night, and was difficult to track down.

To handle this odor, we rigged a goose neck trap as shown in figure 2. This trap is bolted to the relief valve in such a way that any gas discharge must pass through the trap. Filling the trap half full of "Orthosolv" eliminated complaints from this source.

In conclusion, lets back-track a little. We don't want to leave the impression that everything becomes a bed of roses once "Orthosolv" treatment is begun. New situations and new odors continually crop up. So far we have been able to handle them with a little common sense in operation, with an able assist from "Orthosolv".

We have had a part of one summer and one winter of experience with the material. This summer will tell the tale. We are looking forward to the summer with quite a bit of anticipation and some foundation for our hope that it won't be like the first part of last summer. If it is, does anyone have a job open?

• • •

Annual Inventory of Equipment and Supplies

Each department head in Dodgeville, Wisc., is required to file with the city clerk an inventory of city property, materials, supplies, equipment and tools as of the end of each year.

● FIG. 1. Sample is filtered through Millipore filter disc, organisms being deposited on filter surface for culturing.

A Remarkable Development in the Control of Water Quality

WALTER W. KENYON,
Vice President
Millipore Filter Corporation

AT the close of the last war it became apparent to the military services that no method now available was nearly adequate to give a proper warning of the onset of bacteriological warfare, which might well begin without any prior warning from a potential enemy. As a result, for the past several years, a remarkable new development has been under test to meet this threat; and the threat has, indeed, been met through the development under the sponsorship of the Chemical Warfare Service, of a material known as the Millipore Filter.

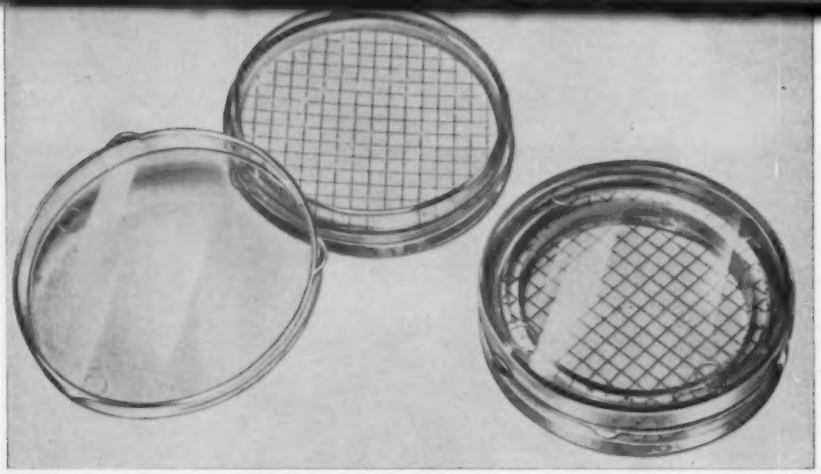
For a long time the very existence of this filter was kept a closely guarded secret and its existence was known only to a very few cooperating laboratories within the Armed Forces and the United States Public Health Service. The filter has resulted in such a remarkable forward step in the detection of bacteria and other contaminants in liquids and in air, that it has been termed, by Major General Creasy, Chief of the Chemical Service, as "A significant step toward a revolutionary detection device . . . which traps bacteria permitting them to be identified within fifteen hours or one sixth of the time previously required."

While the manufacturing procedures and many technical details surrounding the filter remain closely guarded under military security regulations, the filter material itself, appropriate simplified apparatus, and those details dealing with its application to public health and water supply have now been released and are available from the Millipore Filter Corporation, 38 Pleasant Street, Watertown, Mass.

Over the last several years, many of the outstanding agencies in the public health field have been cooperating in the development of the techniques associated with the Millipore Filter (or MF®), as it is now called in scientific circles, especially as it bears upon control of potable water sources. Included in these agencies are The American Public Health Association, the U. S. Public Health Service and the American Water Works Association. The Millipore techniques will now be included in the present or tenth edition of the "Standard Methods for the Examination of Water and Sewage," as a tentative method. Now the possibilities inherent in the use of the filter will become available to laboratories everywhere; large or small, Federal, state or municipal. Many water supply superintendents and public health officers have already taken the initial steps to make use of this remarkable new tool and to bring the control of their water supplies closer to the source.

What is the Millipore Filter, or MF®, that it should thus have displaced methods for the examination of contaminants in potable waters which have remained standard for nearly fifty years?

The chemist would describe the Millipore filter as a non-fibrous cellulose ester sheet material of approximately 150 microns thickness.



● **FIG. 2. Type of disposable plastic culture dish with ready-to-use nutrient pad.**

With the aid of electron-photomicrographs he would discover a porous matrix more than 80 percent voids. But the most surprising facet would be the uncanny uniformity of the billions of tiny openings on the surface of the filter; openings on the order of one half a micron or approximately 20 millionths of an inch. The bacteriololgist working beside him, noting that this size is such as to provide a complete or absolute screen against the passage of bacteria might then suggest that it be used to determine the count of bacteria in a given volume of potable waters by simply filtering them from the water and counting them. Of course, the most convenient way of counting the bacterial cells is to place the filter upon a nutrient pad and allow each "cell" to give rise to a "colony" which may be seen with the naked eye. Herein lies the really revolutionary phase of the entire process: bacterial cells quantitatively isolated from the water, find themselves, so to speak on a two dimensional surface perched on pinnacles defined by the millions of tiny capillaries perpendicular to the plane of the filter surface. The nutrient solution beneath the filter moves upward by capillarity. Bacteria which, immersed in a tube of nutrient (as in the old M.P.N. procedures) would require three to four days before developing sufficiently to confirm their presence, grow to a size visible to the naked eye within a period of as little as four hours and may often be identified as to type with absolute certainty in as little as fifteen to sixteen hours.

What, then, are the implications of the Millipore Filter for the municipal water superintendent, the public health offier and laboratory technician charged with the protection of the populace served by the water supplies of a given area?

1. Detection and identification of pathogenic organisms may be accomplished in as little as 15 or 16 hours.
2. A level of accuracy has been established which has been tentatively determined statistically as the equivalent of four 5 tube MPN's.
3. The isolation of specific pathogens with a relative ease not hereto possible (in part due to the enormously large sample size permitted.)
4. The simplicity of use of the Millipore Filter and of the analysis of results obtained by its use has permitted a sharp reduction in the technician hours required to establish adequate water controls, while at the same time assuring greater reliability of results.

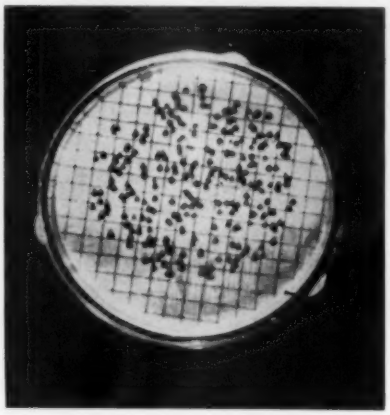
Perhaps the most outstanding feature of the procedure is the availability of results in a very much shorter period of time which permits prompt initiation of corrective measures where indicated and places this control on a day to day basis. Incidentially, this very feature permits early release to service of newly installed pipelines. Previous methods often served only as a historical record of seasonal and other large variations in water conditions.

Analysis of water supplies for bacteriological contaminants consists, with the Millipore filter, of three simple steps—

1. Filtration
2. Incubation
3. Observation of results

Water samples are collected in a sterile container from reservoirs, streams or other water sources. A sample from each source is then filtered in a known volume, say 100 cc, through a Millipore Filter held in standardized Filter Holder (See Fig. 1). The filters and apparatus are easily sterilized by any of several simple procedures, and no great skill is required for their use. While the water passes easily through the filter, bacterial cells are unable to do so and are deposited on its surface. A water sample of the size indicated would pass through a filter in about one minute.

The filter bearing the bacteria on its surface is then placed on a nutrient pad in a small dish, for example, the plastic petri dish illustrated in Fig. 2. The nutrient solutions recommended in "Standard Methods for the Examination of Water and Sewage" are available



● **FIG. 3. Exact count can be made in four hours, identification in 16 hours.**

ready for use from the Albimi Laboratories of New York, The Baltimore Biological Laboratories of Maryland and Difco Laboratories of Detroit. The petri dish bearing the filter and nutrient solution is then placed in an incubator at approximately body temperature for a period of 15 to 16 hours. Some techniques call for the transfer of the filter to a different media at the end of a few hours for the most exacting analytical techniques.

At the end of the incubation period the filter and dish are removed from the incubator. Colonies, each grown from a single cell in the original sample, may be observed readily with the naked eye. A grid imprinted on the filter surface provides a convenient means of determining the number of organisms originally present in the filtered sample. Coliforms (that group of organisms of particular interest to the water superintendent or public health officer) are entirely different in their appearance from other, perhaps harmless, organisms. Fig. 3 shows a typical culture on the surface of the Millipore Filter at the expiration of the incubation period.

The foregoing would appear to be valid reasons for establishing the MF® in the water bacteriology laboratories; however, there is another and extremely compelling reason.

(*Continued on page* 215)

● KIND OF work being done on a typical job is inspected by the authors, H. E. Carlson, County Road Commissioner, right, and G. E. Nichols, left, Assistant Commissioner, Kings Co., California.

Ratings for Rational Road System Evaluation and Planning

H. E. CARLSON, Road Commissioner, and **G. E. NICHOLS,** Assistant Road Commissioner, Kings County, California

THERE HAS been completed in Kings County a road study titled "The Kings County Road and Bridge Adequacy and Improvement Priority Study". It is a rational approach to the engineering and economic evaluation of the road system. It develops data for future planning and programming of improvements based on relative need and economic warrant. Kings County is the first in the State of California and possibly the Nation to produce a study of this scope and practicability, although some state highway departments have developed sufficiency ratings of various forms. It is not a substitute for good judgment, but will be most invaluable to the road commissioner and board of supervisors in determining which projects should be included in the annual budget for the next several years. From our study we have evolved a five-year improvement program based on utilization of estimated highway users' funds which will provide for the greatest return for every dollar spent.

Let us now turn to Kings County. It is a typical medium size agricultural county of approximately 1,400 square miles area in the center of the San Joaquin Valley of California. The population is about 50,000 with automobile registration close to 28,000. Its economy is largely dependent on cotton, grain, dairy products and petroleum. The need for good farm to market roads and main highways is very manifest.

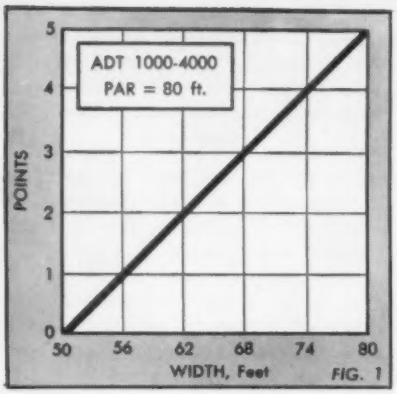
Road problems of Kings County are essentially the same as those of other counties. However, there are certain conditions which are germane only to this area, those being critical foundation conditions in the old Tulare Lake Bed and the lack of suitable sources of aggregate in the County. In the past only a minimum of engineering had been done on road foundations and very few permanent pavements were constructed. About 90 percent of the road system is oiled earth, with fair to poor drainage and geometric features and considerable foundation failure occurrence. Typical of this area, road oil being available nearby, practically all road construction has been by bituminous surface treatment. The old bond issue highway system still remains as our basic hard-surfaced thoroughfares.

Kings County's estimate of critical road deficiencies was approximately $6 million based on the 1953 estimate. As the total annual road department budget expenditures are under 1 million dollars in Kings County, we recognized the need for a road adequacy and priority study. We were vitally concerned with how and where to spend construction and maintenance funds and how to balance these.

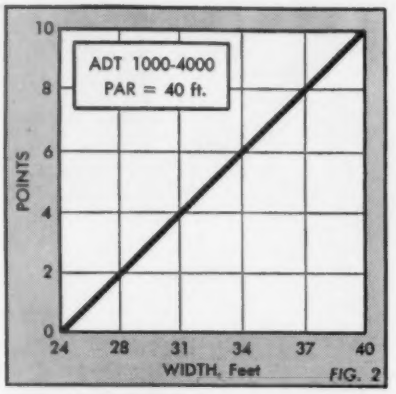
Why The Study?

What are the merits for such a study? Why is it needed? There are several reasons: (1) It will aid the Road Commissioner and the Board of Supervisors in budgeting funds for road and bridge improvement on a basis of economic priority; (2) each section of road evaluated will be compared to its design standard, although the adequacy rating resolves all evaluations to a relative basis; (3) the element of personal judgment in determining the relative adequacy of a road will be minimized; (4) it will keep the Board of Supervisors advised as to existing deficiencies and the funds required to correct these to the design standards; (5) with an objective rating system it is possible to measure at definite intervals the average point rating of the road system, thus determining the rate of progress of the road improvement program; (6) by representing the condition of each road graphically, it will aid in explaining to the public the reason for current and future programs; and (7) it will enable the County to make road improvements to definite standards which are economically justifiable.

A brief step-by-step procedure adopted in the development of this study is as follows. The study resolved itself into two major com-



● **RIGHT-OF-WAY width rating curve, see first column of opposite page. NOTE that separate plates are developed for rating each traffic group listed.**



● **ROADBED width rating curve is based on width in feet of the road.**

ponents: (1) Determination of the relative adequacy of each road and bridge; and (2) establishing priorities for improvement. The first step necessary in determining the relative adequacy of each road was to determine its average daily traffic. This was done by personal counts and mechanical counters. Adjustments were made to allow for seasonal variations. Roads were divided into five different groups depending on average daily traffic. Design standards were established for each road group which were very close to the design standards adopted by the County Engineers Association of California. Design standards of the five traffic groups are shown in Table 1. Road classifications are as follows: (1) Major primary highways of which we have 70 miles, with an average daily traffic 1,000 to 4,000 vehicles; (2) intermediate primary highways, 120 miles, ADT 400 to 1000 vehicles; (3) minor primary and major secondary roads, 360 miles, ADT 100 to 400 vehicles; (4) feeder roads, 150 miles, ADT 50 to 100; and (5) minor secondary or access roads, 100 miles, ADT less than 50. Following evaluation of these 800 miles, a design standard was adopted for each traffic group to which each type of road and bridge should be constructed.

The adequacy ratings were obtained by comparing the existing conditions of the various roads to their respective design standards. An adequacy rating form was devised which was used while making the field inventory. A road's adequacy was measured by four principal components: geometric design, physical design, safety and the amount of service which the road renders to the community. The combined point ratings of the four components is a measure of the road's adequacy. A perfect road has 100 points. Plates, tables and maps have been prepared to depict in tabular form, and graphically, the method of rating each element and the point ratings assigned to each road section.

With the design and the physical data known, it now becomes a problem of dividing the road section into components necessary to arrive at its adequacy; namely, geometric design, physical design, safety and the service which a road renders to the community. In general, ratings were made as follows:

Table 1—Design Standards for Five Traffic Groups

Design Feature	*Terrain*	*Average Daily Traffic* 50	50 to 100	100 to 400	400 to 1000	1000 to 4000
DESIGN STANDARDS FOR ROADS						
Right of Way Width		40	50	60	80	80
Roadbed Width (feet)	Flat	24	28	30	34	40
	Rolling	24	26	28	30	38
	Mountainous	24	24	26	28	34
Surface Width (feet)		16	20	22	24	24
Radii (feet)	Flat	400	400	650	800	1000
	Rolling	250	250	450	525	750
	Mountainous	100	100	250	325	525
Grade (percent)	Flat	7	6	6	5	3
	Rolling	12	8	8	7	5
	Mountainous	15	12	10	9	6
Stopping Sight Distance (feet)	Flat	275	350	375	400	550
	Rolling	250	275	300	325	425
	Mountainous	125	200	225	250	300
Design Speed (mph)	Flat	40	45	50	55	65
	Rolling	30	35	40	45	55
	Mountainous	20	25	30	35	45
DESIGN STANDARDS FOR BRIDGES						
Width (feet)		18	24	26	26	28
Design Loading		H-10	H-12½	H-15	H-20	H-20

Table 2—Pavement Section Standards

Average Daily Traffic	*Section*
1000 - 4000	40-ft. compacted subgrade; 6-in. by 31-ft. Class C CTB or equivalent rock base; 2½-in. by 24-ft. PMS; 2½-in. by 3-ft. PMS tapered shoulders.
400 - 1000	34-ft. compacted subgrade; 4-in. Class C CTB base; 2-in. by 24-ft. RMS; 2-ft. BST shoulders.
100 - 400	30-ft. compacted subgrade; stabilized base where required; 2-in. by 20-ft. BST.
50 - 100	28-ft. compacted subgrade; 2-in. by 20 ft. BST.
Less than 50	24-ft. compacted subgrade; 2-in. by 16-ft. BST.

Geometric Design Adequacy

Right-of-Way Width: Par 5. See Fig. 1. The right-of-way width was obtained from field measurements and office records. The point value assigned was determined from the straight-line curve of Fig. 1.

Roadbed Width: Par 10. See Fig. 2. The roadbed width was measured in feet on the road. A straight-line curve, Fig. 2, was used for the rating of the roadbed. The degree of deficiency increases so slightly with the decrease of the roadbed that a straight-line curve was used for the rating of this component.

Surface Width: Par 10. See Fig. 3. Surface width was measured in feet on the road. The surface rating curves were developed on the basis that the rate of deficiency increases as the width decreases; if a 20-ft. surface were required, it would not be as serious to have a width of 19 feet as it would for a road carrying the same amount of traffic to decrease from 16 feet to 15 feet.

Gradient: Par 5. No curves have been developed for gradient but definite procedures for its rating have been established. Most of our roads are on flat terrain and the percent grade is not a major factor in rating. Our gradient rating considers the deficiencies in vertical alignment, as at railroads, structures and levees, and also the elevation of the grade line with respect to what the grade line should be. The anticipated grade line or the proposed grade line was determined largely from the elevations on both sides of the road. The system used in rating gradient is as follows: (1) A reduction of one point from the par value for each one foot or fraction thereof that the existing road is below desired grade. Where vertical grade is in excess of standard, par is reduced one point per degree. (2) A reduction of one point from the par value per mile for each deficiency in vertical alignment at a structure or levee. (3) A reduction of two points per mile for each deficiency in vertical alignment at a railroad crossing. (4) A reduction of one point per mile for each five inconsistencies in vertical alignment other than those already mentioned as applying at structures, levees and railroad crossings.

Alignment: Par 5. See Fig. 4. In Kings County most roads are straight and it was not difficult to rate all sub-standard curves separately. Fig. 4 indicates the degree of deficiency of each curve.

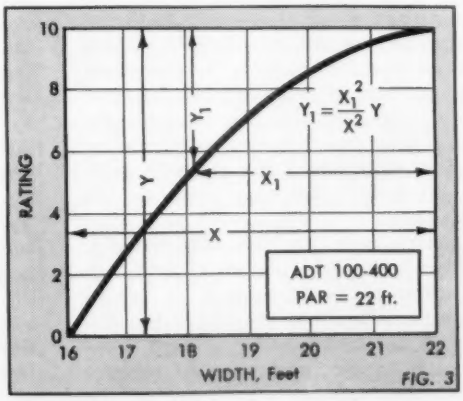
Stopping Sight Distance: Par 5. The stopping sight distance used as par is the minimum sight distance to permit a driver traveling at the design speed to stop his vehicle before reaching a four-inch high stationary object in his lane. The rating to be assigned for the stopping sight distance is based on the number of deficiencies in stopping sight distance per mile. This rating is applied to vertical alignment deficiency only.

Physical Design Adequacy

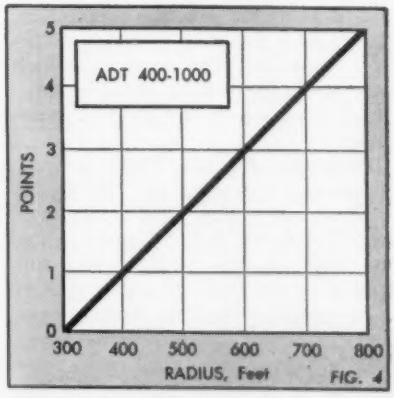
Surface Rating: Par 10. (1) Condition—Par 5. This rating takes into consideration the smoothness, texture and riding qualities of the surface in addition to surface distortion and cracks. Two points are allotted if the road is smooth and an additional three points if it is free from surface distortion, cracks and evidence of failure. (2) Adequacy —Par 5.—(Tables No. 2 and 3). The adequacy of the surface is based upon its width compared to the design width, its condition and its estimated future life compared to the design life of the pavement type which is proposed for the road carrying that particular traffic volume. Following is an example to help clarify this rating procedure: ADT, 650 vehicles; surface width

Table 3—Assumed Life of Surfaces

Average Daily Traffic	*Surface Type*	*Estimated Life*
	WITH DESIGN FOUNDATION	
1000 - 4000	3-in. Plant Mix Surface	20 years
" "	Bituminous Surface Treatment	1 year
400 - 1000	2-in. Road Mix Surface	16 years
" "	Bituminous Surface Treatment	4 years
100 - 400	Bituminous Surface Treatment (Stabilized Base)	10 years
50 - 100	Bituminous Surface Treatment	8 years
Less than 50	Bituminous Surface Treatment	12 years
	WITH INADEQUATE FOUNDATION	
1000 - 4000	Plant Mix Surface	5 years
" "	Bituminous Surface Treatment	1 year
400 - 1000	Road Mix Surface	5 years
" "	Bituminous Surface Treatment	1 year
100 - 400	Bituminous Surface Treatment	2 years
50 to 100	Bituminous Surface Treatment	4 years
Less than 50	Bituminous Surface Treatment	6 years



● **SURFACE** width rating is based on a par of 22 ft. measured on the road in the field.



● **ALIGNMENT** rating is based on deficiency value of each roadway curve.

Table 4—Assumed Life of Foundations

Average Daily Traffic	Foundation	On High Type Native Soil	On Weak Native Soil
1000 - 4000	Design Foundation	20 years	20 years
" "	Compacted Subgrade Only	2 years	1 year
400 - 1000	Design Foundation	16 years	16 years
" "	Compacted Subgrade Only	4 years	1 year
100 - 400	Design Foundation	10 years	10 years
" "	Compacted Subgrade Only	6 years	2 years
50 - 100	Compacted Subgrade	8 years	4 years
Less than 50	Compacted Subgrade	12 years	6 years

18 ft.; design standard 24 ft.; bituminous surface treatment in place; surface condition 5 points; foundation inadequate; estimated life of design surface 5 years from Table 3; estimated life of existing surface 1 year from Table 3. Surface adequacy is a function of the road condition, width and life expectancy, or

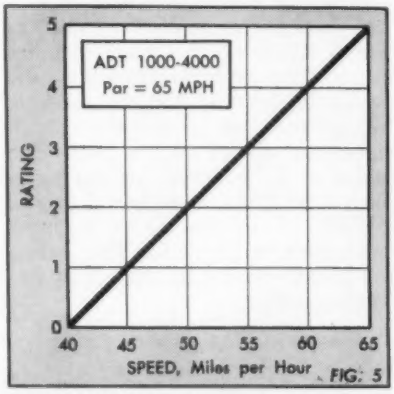
$$5 \times \frac{18}{24} \times \frac{1}{5} = 0.75, \text{ or 1 point.}$$

Foundation: Par 10. (1) Condition—Par 5. The foundation condition rating is based upon the degree of plasticity of the foundation soil and the amount or number of foundation failures observed per mile. Three points were given to the strength or degree of plasticity of the soil and two points to the observed number of foundation failures. (2) Adequacy—Par 5. (Tables No. 2 and 4). The adequacy of the foundation is rated similarly to that of the adequacy of the surface. The adequacy is a function of the foundation width compared to the design width and the design life of the foundation. It is also a function of the foundation condition. The example which was used for rating surface adequacy applies to foundation adequacy.

Drainage: Par 5. The following procedure was used for the rating of drainage: (1) One point was deducted from the par value when one side of the roadbed was not graded according to the design cross-section. (2) Two points were deducted from the par value when both sides of the road were not graded in conformance with the design cross-section. (3) One point per mile was deducted from the par value at each place where water impounds over the roadbed after a storm or from farm irrigation.

Safety

Accident Factor: Par 5. The accident rating is a function of the fatal, personal injury and property damage accidents per mile of road section. Four points were assigned for each fatal accident, two points for each property accident. Based upon accident records for two years, point ratings were totaled for each mile of road in the County. An accident factor rating was applied after determining the range in accident points for each road in the County.



● **MAXIMUM safe speed rating is obtained by making field observations.**

Accidents are caused, usually, from a combination of several different elements and it is oftentimes difficult to determine the extent to which sub-standard geometric design and physical characteristics can be attributed to the accident. For this reason, the point ratings have been assigned without any research as to the cause of the accidents.

Alignment Consistency: Par 5. This rating is a function of the number of inconsistencies in horizontal alignment per mile of road.

Maximum Safe Speed: Par 5. See Fig. 5. The maximum safe speed rating is assigned by comparing the maximum safe speed as observed in the field with the design speed for the road being studied.

Service

Route Classification: Par 10. See Fig. 6. The point rating to be applied for route classification is determined by the type of traffic which a road carries in addition to the geometric design, physical design and safety adequacy of that road. The steps to follow in the rating of this component are as follows: (1) Bus routes, mail routes, milk routes and main trucking routes in the County are accumulated and each road given a potential route classification point rating ranging between zero and ten points. (2) The geometric design, physical design and safety ratings for each road in the County are totaled up. These totals will range between zero and eighty points. (3) As the route classification point rating is a function of the road's condition, the actual point rating which it is assigned is determined by the service rating curve, Fig. 6.

Community Service: Par 10. See Fig. 6. This component takes into consideration the importance of a road's strategic location within the County. Each road in the County was given a potential point rating for community service which was determined on the following basis: If the road connects (1) two state highways, 3 points; (2) two primary county roads, or one primary county road and one state highway, 2 points; (3) two centers of population, 2 points; (4) an agricultural or industrial area to a major primary or state highway, 2 points; (5) if it services the local area only, 1 point; (6) if it connects to only one center of population, 1 point. The maximum potential of any road is 10 points. The final rating is determined as was done to determine the point ratings for route classification; namely, the point rating for geometric design, physical design and safety were totaled up and the point assigned for community service determined from Fig. 6.

Each bridge and culvert in the county was measured and its condition observed. Each structure was

given a point rating which was a measure of its adequacy compared to a new one constructed to the design standard. Components used to measure its adequacy compared to a new one constructed to the design standard were width, condition and structural adequacy.

Bridge Ratings

Width: Par 30. Fig. 7. The existing bridge width was obtained by field measurements. The point value assigned was determined from the curves shown on Fig. 7.

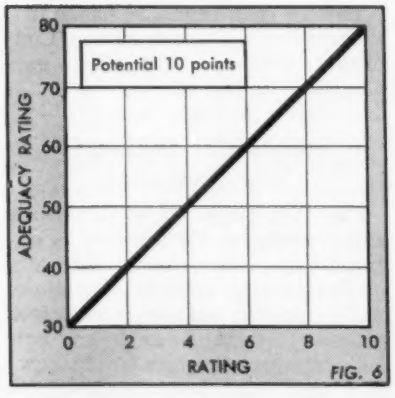
Condition: Par 20. All concrete culverts and bridges are in good condition. Timber structures were given a point rating dependent on condition of columns, caps, stringers, decking and wings.

Structural Adequacy: Par 50. The concrete structures are virtually all adequate. On timber bridges, the point rating for structural adequacy was a function of condition, age and equivalent wheel load. (EWL). Existing H-loading design compared to design standards was not used because many of the bridges have been braced, making computation difficult and probably inaccurate.

Roads have been divided into sections with breaking points usually where the design standard of the road changes. Exceptions include long stretches of road which are to be constructed to the same standard.

Economic Analyses

The economic analyses of this study embraced three essential phases: (1) costs, (2) revenues and (3) benefits. Revenues must be sufficient to balance costs or bankruptcy is inevitable after reserves are expended. The foundation of the highway program is not sound unless the benefits gained by the public are substantially equal to or greater than the costs. Our method of analyzing the three essential phases will be considered individually.

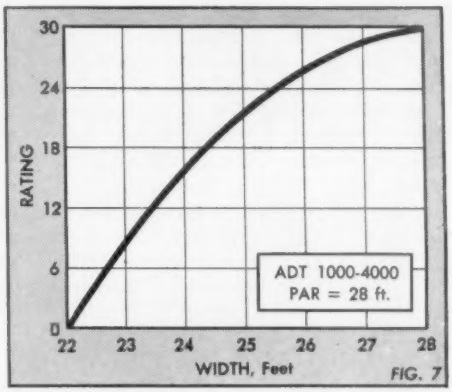


● **SERVICE rating has two bases: Route classification and Community Service. If either is 0, then the other component is rated at 10 points. See text in opposite column for additional data on methods used for this rating.**

If Maintained to Existing Standard: The annual cost of maintaining each mile of road to its existing standard was estimated. About 90 percent of the county's roads are oil-mix, with the majority of the mileage having weak foundations. On these roads, the major maintenance expense has been re-oiling. From oiling records and experience of the County Road Commissioner and Maintenance Superintendent, the life of each section of oil-mix road was obtained quite accurately. Cost of oiling one mile of road was the sum of labor, equipment and material costs after an overhead factor had been applied. The Deputy Road Commissioner supplied pertinent data relative to equipment rental rates, labor rates and overhead factors. Other items included in estimating maintenance costs were patching, shoulder maintenance and handling of signs and flares in areas of poor drainage. Cost of these items was prorated.

If Constructed to Design Standard: The cost of constructing each section of road to its design standard was then estimated. These estimates do not include the construction of bridges which may exist in the mile of road under consideration. The data used for making these cost estimates are too bulky to include here; but they include costs in place of subbase, base and surfacing. Thickness of imported borrow required was estimated from soil conditions, drainage and the elevation of adjacent terrain. Current tonnage prices were used for surfacing.

Annual Cost: In order to know whether it was more economical to maintain a mile of road to its existing standard or construct it to the new design standard, it was necessary to compare the annual cost of the two. The annual cost to construct the road to the new design standard was determined by the straight line depreciation plus average interest method. Factors included in determining annual cost were first cost, salvage value, life in years, and interest rate. Interest rate used was the return the County Treasurer receives on loaned money. An economic ratio was obtained by dividing the annual cost of maintaining a road to its existing standard by the annual cost of constructing a new road. The higher the economic ratio, the more economical it is to construct to appropriate standards rather than maintain.



● **BRIDGE ratings are based on width, condition and structural adequacy. The chart above is used to determine the point value for width. See first column, this page.**

Revenues which are earned to be put back into the County Road and highway system include (1) Highway Users' Tax, (2) Auto In Lieu Tax, (3) Fines and Forfeitures and (4) Federal Aid and State Aid Money to be used on FAS routes. The sum of these currently is about $840,000 annually in Kings County.

Computing Earning Capacity

It has been assumed that the sum of the benefits or earnings is equal to the total revenues. The earning capacity of a road or the benefits accruing to the road users are very nearly proportional to the traffic which passes over it. However, a 3-axle truck will earn more revenue than a passenger car; by the same token a truck and trailer will earn more than a 3-axle truck. It has been assumed that multi-axled vehicles earn revenue in proportion to their equivalent wheel loads as assumed by the California State Division of Highways in their pavement design. The revenue per mile which each road section earned was determined by spreading total revenues to each mile of road on the basis of vehicle miles, taking into consideration the percentage of truck traffic passing over the route.

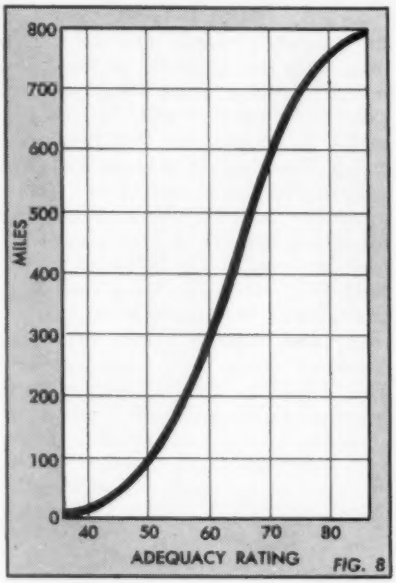
Will the revenues the road earns equal the annual construction cost? A feasibility factor was obtained by dividing the earning capacity of each road by the annual con-

struction cost. The higher the factor the more feasible, or the greater the benefits as related to cost.

Priority ratings for road sections were obtained by multiplying the economic ratio by the feasibility factor and dividing the result by the adequacy rating expressed as a decimal fraction. We now have a list of priority numbers from which projects can be selected in proper sequence. While No. 1 on the priority list is the road section theoretically considered to be the most inadequate one with the highest economic justification, the ratings established cannot be used without good judgement. They are to serve as guides. From the results of our study we have evolved a five-year improvement program, which is represented both graphically and in tabular form in our report. In programming there are certain considerations and conditions which influence the final selection of projects. In order to get more public support we have found that it is wise to include projects in all parts of the County which have relatively high priorities, thereby minimizing the shifting of personnel and increasing morale and efficiency. In some cases, too, it was found that a road would have a relatively high overall adequacy rating, but would have weak foundation and surfacing. If, on such a road, it was found the annual maintenance cost was excessive in comparison to the annual construction cost, it was also included in the five-year program. In the case of bridges, we have selected those with low ratings which were considered structurally inadequate and have endeavored to eliminate, insofar as possible, the construction of temporary structures.

Our study has included 800 miles out of our total 1,040 mile road system. The roads not rated were subdivision roads, other county urban streets, and rural roads of minor importance. It is recommended that those roads, particularly subdivision streets, be the subject of a special study and improvement be made by local or assessment district tax. Our study has also enabled us to establish a comprehensive cost accounting system by road sections; also it will be invaluable in selecting primary roads and as a basis for development of a master street and highway plan by the County Planning Commission.

This type of study can be used to evaluate the efficiency of a county road system. From the results of this study a point rating can be established below which roads are deemed to be critically deficient. Using this method, the estimated cost to improve critical deficiencies will be measured to a definite point year to year, thus giving an accurate yardstick for gauging the rate of improvement. Critical roads and bridge deficiencies which are selected by judgment, and with no definite



● **ADEQUACY rating chart is used to determine priority of improvement work.**

standards to compare to, have little meaning and also make measuring the rate of progress difficult. Critical deficiencies are selected by using the following criteria (See Fig. 8):

Priority rating (range 0-13), 3 or more; adequacy rating (par 100), less than 50; geometric design rating (par 40), less than 18; physical design rating (par 25), less than 7; bridges (par 100), less than 50.

By using factual data rather than personal judgment, critical deficiencies have been reduced by approximately 25 percent in our 1954 estimate.

There has been much interest in the subject of road sufficiency ratings during the past few years; however, rational means of road programming, of which the road adequacy and priority study is an example, have been too long in development as a tool for more effective road administration. When practically every road in the system is substandard and requires reconstruction or maintenance, it is difficult to program available funds effectively. A method of selectivity is, therefore, essential in order that the public will benefit by a better job and a more profitable one. Without a formal rating, the engineer and road administrator must rely on his own judgment and that of his associates to evaluate the merits of each project. The rating system, however, formalizes the elements of highway planning and bridges the gap between the needs which an engineer knows and the support he must have, for it shows conclusively where public funds can most judiciously be spent. The promise of the rating study is that it will separate fact from fancy; sound judgment from guesswork; decision from indecision; and finality from expediency.

Whether or not our approach to road planning is irrefutable in all of its elements is not too important. It is certainly a step in the right direction and one which every conscientious road administrator should undertake in order that his stewardship of public funds will not be jeopardized. The merits outlined should be sufficient reason for our interest in pursuing this matter further. The matter of highway policies can best be determined by the governing boards after a thorough analysis of their road needs and by weighing all of the factual data which should influence them in their judgment. The public's interest should be our noblest cause.

We wish to express our gratitude to the Kings County Board of Supervisors for their objective approach to road problems in authorizing this study. We are also appreciative of the cooperation of the California Division of Highways and Institute of Transportation and Traffic Engineering of the University of California and to the firm of Porter, Urquhart, & Beavin, Consulting Engineers, for their participation in the study.

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Chlorination Studied in New Hampshire

The staff of the New Hampshire Water Pollution Commission is engaged in conducting laboratory studies on after-growth of coliform organisms in heavily chlorinated sewage. It is intended to evaluate the after-growth problem in sewages that have been treated with 20 and 40 ppm of chlorine, using a fifteen minute contact period. Similar work is also being undertaken by Professor Edward S. Brown at the Thayer School of Engineering, Dartmouth College, N. H.

IT'S CHEAPER BY THE GALLON

ESKEL NORDELL

Eskel Nordell is Director of Technical Information of The Permutit Co. and author of "Water Treatment for Industrial and Other Uses," Reinhold Publishing Corp., N. Y.

Zeolite water softeners are usually regenerated with purchased salt which has a purity of 98 percent or better. So we are inclined to believe that the zeolite softener is very particular as to the quality of salt used in its regeneration. Also we are accustomed to see the chemical reactions written as if the zeolite were completely in the sodium condition before the softening run and that it is completely transformed to the calcium and magnesium state at the end of the softening run.

Nothing could be further from the truth. First, the zeolite softener can be regenerated with much lower grades of salt. Second, the zeolite is not entirely in the sodium state before the softening run and it is not completely in the calcium and magnesium state at the end of the softening run.

In fact, zeolite can be and is being regenerated with salt that contains 23 percent of impurities and these impurities are mostly calcium and magnesium chlorides. Also, this is being done in both municipal and industrial plants in the United States, Cuba, Mexico, South America and Japan.

For these plants are using sea water for regeneration and sea water contains 3.5 percent total salts made up of 2.7 percent of sodium chloride and 0.8 percent of impurities, mostly magnesium and calcium salts. As for operating costs, one municipal water softening plant with a 60 to 70 gpg hardness water would have had a salt cost of $155.00 per million gallons if it purchased its salt. Instead, it used sea water at a cost of only $9.00 per mg.

A large industrial plant is softening a 20 gpg water to practically zero hardness with a sea water regenerated zeolite water softening plant. With the most modern type of sodium cation exchanger (zeolite), operating at the highest efficiency, the salt consumption if dry salt were used, would have been 2¾ tons per million gallons. Yet with sea water regeneration, the cost is only some $3.00 per million gallons which, of course, is only a small fraction of the cost of 2¾ tons of salt.

● **WATER softening plant at Hollywood, Fla., which uses sea water for regeneration of the zeolites. Water hardness averages about 290 parts per million.**

Sea Water

While some differences in the degree of salinity are found in the oceans, the relative proportions of the main constituents, as given in Table 1, are the same for all oceans.

Of course, since the salt used contains some 23 percent of calcium and magnesium salts, the zeolite does not get as fully regenerated as it would be with salt having less than 2 percent of impurities in it. So the water softening capacity is less per cubic foot than when the 98 percent salt is used and therefore more zeolite has to be used in the softener units.

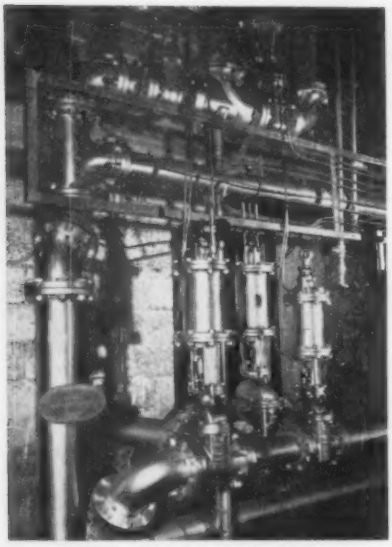
To be specific, from one and two-thirds up to two and one-half times as much zeolite has to be used to get the same water softening capacity as would be obtained with 98 percent salt. This means a larger plant and a larger capital investment. However, this is a matter of small moment for. in a favorable location, this 73 percent salt is free for the taking; available in unlimited quantities; carries no freight charges; doesn't have to be dissolved in water for it is already in solution; requires no treatment except perhaps chlorination and filtration; and when used for regenerating a zeolite plant, offers the lowest of all water softening costs.

Table 1: Sea Water—Main Constituents

Calcium	as ppm CaCO,			— 1000
Magnesium	"	"	"	5234
Sodium	"	"	"	22950
Potassium	"	"	"	486
Bicarbonate	"	"	"	115
Chloride	"	"	"	26790
Sulfate	"	"	"	2757
Bromide	"	"	"	41
Total Hardness	"	"	"	6234

Hollywood, Florida

One city which has been using a sea water regenerated plant for over 16 years is that fabulously fast growing city of Hollywood on Florida's famous Gold Coast. Hollywood's water supply is drawn from a number of 60 to 125-foot deep wells, has a hardness, composed mostly of calcium bicarbonate, which averages about 290 ppm or 17 gpg. In 1936, the city installed the first municipal water softening plant of the zeolite type in Florida. This plant was described by the consulting engineer, W. Austin



● **CLOSE-UP view of automatic valves in the water softening installation.**

Smith, in the Sept., 1937 edition of *Public Works*.

It consisted of three 9′0″ diameter by 10′0″ high (in the straight) Permutit automatic water softeners using Super-Zeo-Dur zeolite. This plant, which had a capacity for softening 1,500,000 gpd of 17 gpg water to a residual of 5 gpg, was regenerated with purchased salt. Fig. 1 is a photograph of this plant as it appeared in the article in *Public Works*.

At that time, Hollywood had a summer population of 3,000 and a winter population of 8,000. A couple of years later, this had increased to 7,000 summer population and 15,000 winter population. This increased the water demand so that in 1939, a fourth zeolite unit was added and two new water mains were run down to the beach replacing the old 6-in. main. Under the directions of William Sydow, consulting engineer on this project, the old 6-in. main was then put to use to bring sea water 4½ miles into the water softening plant which was then swung over to sea water regeneration. After a number of years of successful operation, this 6-in. line was replaced by a 10-in. Transite line.

But Hollywood kept on growing and in 1948, it was necessary to increase the size of the plant again. Four more Permutit units, using the carbonaceous cation exchanger, Zeo-Karb, were added and one of the Super-Zeo-Dur units was changed to Zeo-Karb. This doubled the size of the plant making its total capacity 4,000,000 gpd.

And Hollywood still kept on growing and in 1953, 4 more units were added in accordance with the plans of the consulting engineers, Reynolds, Smith and Hills. These were larger units—10′0″ in diameter by 12′ high in the straight side of the shell. Also they had fills of Permutit Q—a new, high capacity type of cation exchanger which, with sea water regeneration, has a capacity per cubic foot three times as great as the carbonaceous type of cation exchanger and four times that of the greensand type of zeolite.

It is interesting to note that the 3 Super-Zeo-Dur units and the 5 Zeo-Karb units are all working along together with the new units and that the maximum capacity of the plant is now 8,500,000 gpd. As for the population of Hollywood, in 1954, the summer population was 25,000 and the winter population 60,000 and it is still growing.

As for the savings accomplished, Charles E. Richheimer of Reynolds, Smith and Hills, made a very thorough study of the comparative costs of sea water regeneration vs. purchased salt regeneration at Hollywood. His figures, including all of the operating costs such as pumping, chlorination, filtration, labor, maintenance charges, etc., showed a net saving of $107.50 per day. As this is based on the average daily consumption, the yearly savings are 365 times this, which is over $39,000.

So, there's no question at all that "It's cheaper by the gallon" than buying it by the ton. Also, while this article has been devoted to sea water regeneration, connate waters and natural brines are also used for regenerating both municipal and industrial zeolite water softeners. These may vary in salinity from one-half up to 5½ times that of sea water. Also, the calcium hardness is usually greater in relation to the magnesium hardness than in sea water. But, if the total salinity is over 3 percent and the chloride content as Cl is not less than 3 times the calcium and magnesium hardness as $CaCO_3$ and it is free or can be freed from other impurities, then it can be used for regenerating zeolite water softening plants.

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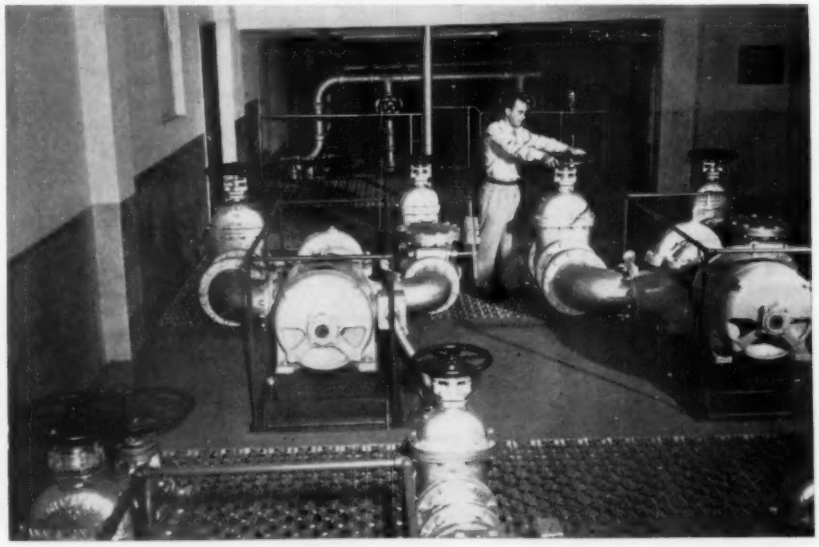


● **WATER plant employee Pete Broome makes an adjustment of the valve on the transfer equipment which brings salt water from the aerator to the softener.**

● **AIR VIEW of Ozark's modern sewage treatment plant, showing standard rate filter, settling tanks, sludge beds, digester and laboratory and office building.**

OUTSTANDING IMPROVEMENTS
INCLUDE MODERN TREATMENT PLANT

INCLUDED in the outstanding municipal improvements made by Ozark, Ala., during the past two years is a new sewage treatment plant designed to handle a flow of 1 mgd. Other improvements, all under the supervision of Ewin Engineering Corp. of Mobile, Ala., comprise a 700-gpm well; a 250,000-gal. elevated water tank; nearly 8½ miles of water mains; about the same mileage of sewers; and some seven miles of streets, with curbs and gutters. This program was carried out under the administration of Mayor James D. Brown. The total outlay for these public improvements was more than $3.5 million. A new municipal building and a new high school are yet to be constructed.

The first project to be completed was 38,000 feet of asphalt streets, with concrete curbs and gutters, on 6-inch clay base, and 2,000 feet of sidewalk. Total costs was $161,516.50. Contractor was B. F. Williams Construction Company of Ozark.

Next on the list was the 822-foot well drilled by Layne Central of Montgomery, Ala., and equipped with a Layne pump; this cost $53,-351. J. M. McCrary Company, Inc., of Atlanta, Ga., was contractor for the system of water mains. This included 24,350 feet of 8-inch mains, 17,196 feet of 6-inch, and 8,900 feet of 2-inch galvanized lines. There were 30 cut-in connections, 150 gate valves and boxes and 65 fire hydrants. Total cost was $169,020.32. The city also, by its own forces, has added $75,000 worth of water mains and sewers to this program.

The double ellipsoidal, all-welded water tank with 250,000 gallons capacity was erected by Chicago Bridge and Iron, Atlanta, Ga., branch, at a cost of $57,235. Water consumption in Ozark averages 650,000 gallons per day.

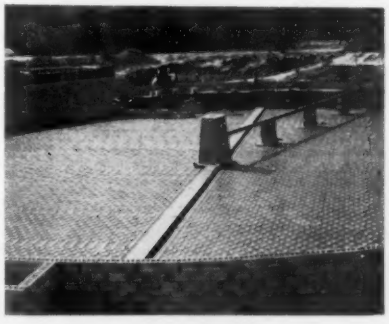
Biggest project of all was the badly-needed 1,000,000-gpd standard trickling filter sewage plant with primary and secondary clarifiers. This plant was built by Carter Construction Company of Geneva, Ala., and Hooper-DeJarnette & McDonald of Andalusia, Ala., at a cost of $442,450.87.

The treatment plant is modern in every respect. The sewage, as it reaches the plant, passes through a Worthington comminutor and Sparling automatic metering devices, which measure the flow, indicate, totalize and record. The clarifiers have Dorr equipment; and the sludge pump and filter distributor were also supplied by Dorr. Filter underdrains were by Natco. Pacific Flush Tank Co. furnished the floating covers and the gas handling equipment. Pre- and post-chlorination equipment is by Wallace & Tiernan.

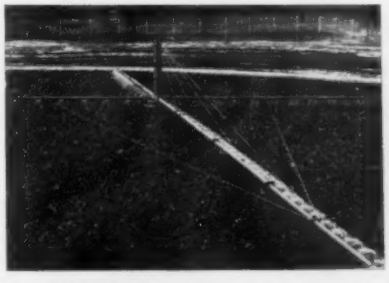
The sewage collection system, including four pumping stations equipped with Shone pneumatic ejectors, consists of 32,968 feet of outfall sewers and 15,681 feet of six-inch cast-iron pressure lines. There are 143 manholes, seven air relief valves and 387 feet of piers.

In carrying out this assignment for Ozark, the consulting engineers were responsible for the architecture, design and engineering of the various projects, including preliminary engineering and economic studies, and the preparation of the necessary application and supporting documents to obtain federal aid in financing the improvements. They also prepared plans and specifications, assisted in advertising for bids and in receiving and tabulating proposals; made recommendations to Ozark officials as to award of contracts to the successful bidders; supervised and inspected the projects throughout the entire period of construction; and checked and approved contractors' monthly estimates of work performed and partial payments due.

The completed sewer and water improvements were financed by a bond issue and about $300,000 of aid from the federal government under a law giving financial assistance to cities in critical defense areas. Only cities in the extreme South to receive moneys under this law were Ozark and Key West, Fla. The necessary analysis of the city's public works as they existed and the forecast and estimate of the improvements needed from the standpoint of public health and sanitation were made by the consultants. The city's successful application for the federal funds was based on these estimates of the needs and the municipality's own borrowing power.



● **VITRIFIED tile underdrains were used in the standard rate filter.**



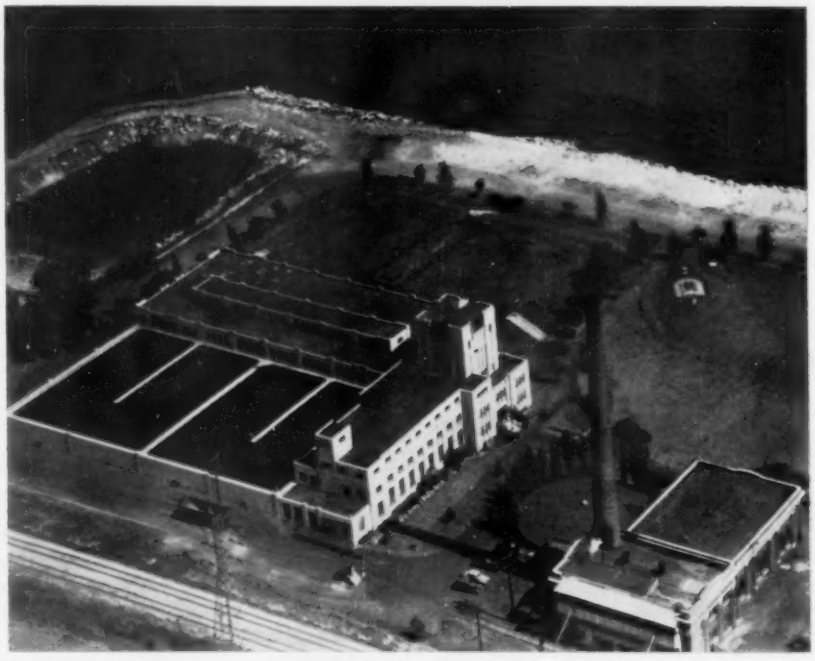
● **TRICKLING filter in operation. Note walls of cement block above.**

Better Taste and Odor Control

A. G. GIANNINI,

Superintendent, Dep't. of Water Works,

Hammond, Ind.



● **WATER filtration plant at Hammond, Ind., has had a taste and odor problem.**

THE filtration plant for the city water supply of Hammond, Indiana, draws water from the southern end of Lake Michigan through an intake extending one mile from its shore. This intake is located in a cove formed by the breakwaters of Calumet Harbor to the North and Indiana Harbor to the South. The Calumet River, which flows through the south side of Chicago, empties into the Lake at Calumet Harbor. A ship canal, having its origin in Indiana Harbor, extends into the highly industrialized Calumet region on the Indiana side of the state line. Therefore, it is understandable that, due to the large metropolitan and industrial area surrounding Hammond, this section of Lake Michigan is subjected to heavy pollution. This comes from nearby municipalities, steel mills, oil refineries and many other diverse industries.

During the early part of January, 1950, a severe taste and odor problem occurred in Hammond. Numerous consumer complaints were received over a period of several days. At that time, the threshold odor of the raw water reached a maximum of 200, and was a type of odor containing phenolic contamination. The phenols in the raw water combined with the chlorine added at the plant to form the well-known medicinal-tasting chlorophenols. The maximum amount of carbon our reciprocating plate machines could feed was 550 pounds per hour. This carbon dosage proved insufficient to reduce the raw water odors to a palatable level and resulted in the consumer complaints.

Although the wastes are diluted somewhat by the time they are received at the Hammond intake crib, precautionary measures must be taken at all times to keep abreast of changes that may occur in the raw water entering the plant. The raw water odor intensity is evaluated by use of the threshold odor test. We have found that it is necessary to sample every two hours when the threshold odor is under 25, and every hour when it is over 25, in order to feed the proper carbon dosage required for a palatable filtered water of 2 threshhold odor or less.

The present method of odor control is based on a suggestion of David C. Colebaugh, chemist for the West Virginia Pulp and Paper Company. He recommended that a sampling station be set up at the end of the mixing basins to reveal what the carbon is accomplishing after 30 minutes contact time with

● **A. G. GIANNINI is Superintendent, Dep't. of Water Works, Hammond.**

Results in Chemical Savings

the raw water. Also, a chlorine residual test was instituted at the end of the mixing basins for the same purpose. Prior to the time these recommendations were put to use, we determined the threshold odor and chlorine residual of the raw water, filtered water and tap water every one or two hours. If the filtered water was unpalatable, it was too late to apply corrective measures in the plant. But by sampling at the end of the mechanically equipped mixing basins, we find that corrective measures, when necessary, can be taken before the water is filtered, thus providing a palatable water at all times. Carbon application points are provided in the plant for additional feeds to the mixing basins and directly on the sand filters for use when the threshold odor exceeds a value of 3 at the end of the mixing basins. Normally we find that we can correct odors in the mixing basins almost immediately by increasing the carbon dosage in the raw water flume. An approximate 90 percent reduction in threshold odor results as the water passes through the mixing basins. Extremely high odors are corrected primarily by adjusting carbon dosages in the flume to maintain a maximum 3 threshold odor at the end of the mixing basins. Since a further reduction in odor is achieved as the water flows through the plant we end up with a palatable one or two threshold odor in the tap water.

Experience in the laboratory indicated that chlorination of phenolic compounds renders them less adsorbable. To correct the occurrence of a similar condition in our plant, Mr. Colebaugh recommended moving the existing point of chlorine application. The chlorine was formerly applied at a point prior to carbon application; now it is applied near the end of the mixing basins approximately 30 minutes after the carbon has had contact with the raw water. We felt that this change rendered more efficient use of the carbon and with better plant control, encouraged us to experiment with existing carbon feed tables which had been set up on the basis of past experience.

In the latter half of 1950 we reduced by 10 percent the existing carbon table and in early 1951 made another 10 percent cut. We were so encouraged by the results of these cuts that in the spring of 1952 we made a 50 percent cut in the table for odors of 20 threshold odor and under. The 20 and under threshold was selected for the final reduction because for approximately three-fourths of the year our threshold odors are in this lower range of the table. The reduced table still maintains a 2 threshold odor at the end of the mixing basins. Table No. 1 indicates the pounds of carbon used in the year 1949 and the resultant hours in 1953, being about three times longer in duration than in 1952, and this accounts for the increased carbon usage during the yearly savings in cost despite price increases. Threshold odor values of 50 and over were reported for 597 year. During these years our chlorine consumption increased with the pumpage and in 1953 we recorded our highest pumpage of 6,697 mg.

● **RECONSTRUCTED carbon feed machine, showing vane pulley drive and hydraulic variable speed reducer. Making adjustment is Michael J. Papach, chief operator.**

TABLE 1—AMOUNT OF CARBON USED AND COST

Year	Carbon Used	Cost of Carbon
	pounds	
1949	773,675	$47,503.65
1950	709,800	43,613.00
1951	639,050	39,495.70
1952	403,970	26,033.23
1953	560,910	39,349.37

During the last five years we reconstructed the existing carbon feed machines to vane feeders with variable speed reducers. We now can feed more than 1,000 pounds per hour, due to the ingenuity of our Chief Operator, Mike Papach, for the nominal cost of the speed reducers.

When sampling from the end of the mixing basins was started, a glass funnel filter with cotton was set up in the laboratory to remove coagulant and carbon. After about a year of paying for cotton replaced with every sample, someone con-

ceived the idea of using three inches of sand from one of our filters instead of the cotton. A backwash arrangement was provided for the sand and the cost of cotton was eliminated. The laboratory filter is now backwashed once or twice a shift as required.

Uniform Testing Methods

To obtain uniform testing of all our water samples, a bath arrangement was installed in the laboratory with an electrical heating unit that maintains a constant temperature of 65° in the samples. This arrangement eliminated the holding of a thermometer in a 500 ml. flask over a stove until the water was heated to 65°. An automatic timer now tells the operator when a sample has been in the bath for seven minutes and has reached the required 65° temperature. The operator then lifts the watch glass off the top of the 250 ml. flask and smells the odors from the flask if any. Three different dilutions of the sample are placed in the bath at one time, thus increasing the speed of testing plus providing uniformity of tests within the limits of human frailties.

The old adage of "Men must have tools to do a better job", has been borne out by the excellent results obtained in the last two years. At this writing there has not been a single consumer complaint about taste or odor in two years. Almost immediately after putting these changes into effect there was a noticeable difference in the quality of our finished product. Consumer complaints became fewer and then only from the more sensitive tasters during periods of extremely high raw water odors. Phenolic compounds had been combining with the chlorine, undetected in the plant, until a taste test of filtered water was instituted as part of the laboratory work at times of odors over 25 threshold. That varying amounts of phenols have been removed successfully by our ever vigilant plant operators is shown in Table 2.

● **WELL-equipped laboratory for taste and odor control testing is essential at Hammond. Leo K. Studebaker, plant chemist, is shown here making odor test.**

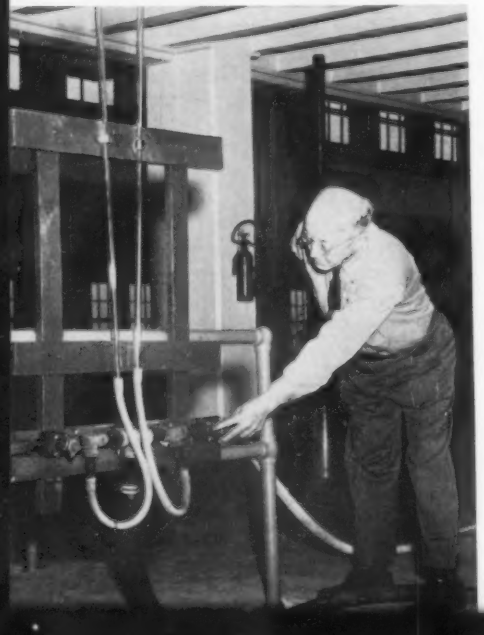
Table 2—Results of Phenol Tests

Date 1954	*Raw Water Odor No.*	*Type of Odor*	*Raw Water Phenol - PPB*	*Filtered Water Phenol - PPB*
Jan. 18	120	Oil	28.6	5.5
Jan. 29 & 30	120	Oil	15.4	7.7
Feb. 19	130	Sewage	14.3	6.6
Apr. 5	120	Oil & Sewage	18.7	9.9
Nov. 10	500	Oil	4.4	3.6

The Pleasant Climax

The pleasant climax of all this work was reached on November 10, 1954 (See Table 2). We successfully treated a raw water having a 500 threshold odor with 1,000 pounds of carbon per million gallons for several hours without a consumer complaint. The previous high water odor recorded in our plant was 300 units and at that time there had been many complaints. Thus, our good record of the past two years remained intact, despite the carbon cost savings of $21,000 in 1952 compared to 1949 as shown in Table I.

Editor's Note: This excellent article by Mr. Giannini is published simultaneously in Public Works and in The Taste and Odor Control Journal.



● **THIS is the chlorine flow equalizing arrangement which is located at the mixing basins for dividing chlorine application between two groups of four mixing basins in series. John Hepp, Filtration Plant Operator, is shown here.**

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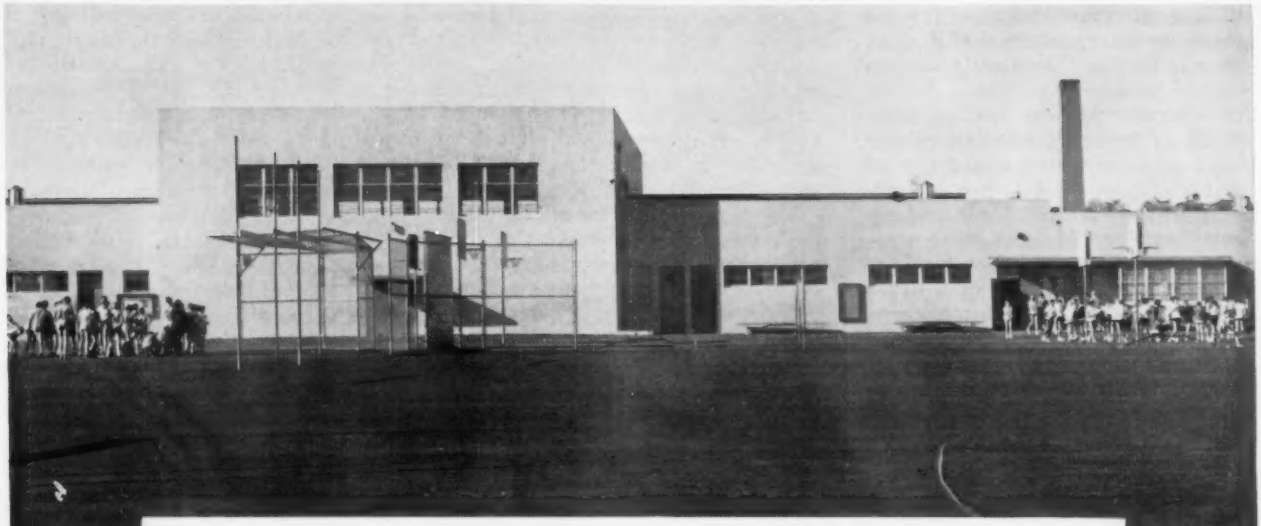
A Garbage Collection Contract is Not a Franchise

The City of Colorado Springs, Colo., was recently charged in a suit with awarding a contract for garbage collection without calling an election to approve a franchise as specified by the city charter. The court said that garbage collection was not a public utility in the established sense, and held that a contract made by the city with a private company is not a franchise. It also stated that garbage collection is a duty imposed upon a city as a governmental function for the preservation of public health and safety and must be performed by city employees or by others under contract to the city.



SEALING PROGRAM

Makes Better Playground Areas

A PROGRESSIVE program for sealing over 500,000 sq. yds. of playground area has been completed by the Los Angeles Board of Education, following one of the most exhaustive studies ever conducted on the use and characteristics of sealing materials. The sealing program, one of the largest ever undertaken, is designed to accomplish four primary objectives: 1) to reduce the severity of playground accidents; 2) to minimize wear on clothing and equipment; 3) to cut costs of playground and school building maintenance; and 4) to increase the life of playground areas.

Completion of the sealing project climaxed an extensive study of surfacing materials, conducted by the Los Angeles Board of Education. The study was aimed at selecting a material (or materials) which would provide smooth, non-skid, abrasive-free surfaces, with maximum resilience, all within a set economic limit. Engineers of the Board of Education's Maintenance and Operations branch recognized that such a seal would mean a saving in wear on clothes, shoes, and athletic equipment, and could well be justified alone for its effect in minimizing playground accidents. It was also clear that additional benefits would be realized in the elimination of dirt and debris that was formerly carried into school

buildings where it presented a problem for janitors. A sizeable test program involving a number of sealing materials, was begun in the Los Angeles School District during 1953, under the direction of the Business Branch, Operations and Maintenance Division. Specifications were written embracing three types of sealing materials: 1) a rubber-base product; 2) a fine-mineral aggregate and asphaltic emulsion mixture; and 3) the fibrated asphaltic material called Walk-Top. The initial tests resulted in the selection of the cold-applied Walk-Top composition for the sealing of a final 4,000-sq. yd. section.

The initial step forward took place in mid-summer, 1954, with the letting of contracts for sealing 3,000,000 sq. ft. of playground area. Bid prices averaged well under $.04 per sq. ft. for both labor and materials. The Walk-Top material was selected for this project. Specifications for the job were written in collaboration with engineers of the American Bitumuls & Asphalt Co., manufacturers of the fibrated asphaltic composition.

The Board of Education, Maintenance and Operations Division, specified a "Seal Coat Type B" as Bitumuls Walk-Top or its approved equal, consisting of suitable binder and fillers and having a consistency in the container after thorough stirring suitable for easy troweling. The specifications further required that after it had been applied and allowed to set, it should become a tough, waterproof, resilient, traffic-resistant wearing surface of a uniform color. Additional specifications were: *Residue:* not less than 60 percent nor more than 70 percent; *Dehydration test at 100 degs. F.:* not less than 60 percent in 48 hrs.; *Solubility:* not less than 15 percent nor more than 30 percent of the residue shall be bitumen soluble in carbon disulphide; *Loss on Ignition:* less than 8.0 percent loss in weight when the residue from the solubility test is ignited.

Playground surfaces were leveled where necessary, cleaned of dust or other foreign materials, then washed, wherever necessary. A uniform bond coat was applied, consisting of one-part bonding primer and four parts water, at the rate of approximately ¼ gal. per sq. yd. Puddles were broomed out and allowed to dry. Surfaces were protected from dust and foot traffic.

The entire contents of each drum of the Walk-Top mixture was emptied into a plaster mixer and mixed to a uniform free-flowing consistency. The contractors found the use of a plaster mixer developed a much more consistent mix. Sufficient water was added to obtain a semi-fluid consistency, but in no case was it diluted more than 30 percent.

Prior to the first application of the asphaltic composition, the surface was fogged with water from a hose. This cooled the surface and left it damp. Any free water was swept out. Subsequent applications were made without prior fogging.

Walk-Top was applied to the area by pouring from a can or a wheeled container in continuous parallel lines. It was spread immediately with rubber-faced squeegees or long-handled hair brooms. Squeegees for brooms were pulled on an angle from the line of spread to roll continually the material toward the operator and not over-flow or "spill" on its forward edge away from the operator.

Two or more applications were made, using a minimum of 30 gals. of Walk-Top per 1,000 sq. ft. Areas with heavy and concentrated traffic received three or more applications with a minimum of 35 gals. per 1,000 sq. ft. of area. The average rate of application, according to the standard specifications of the American Bitumuls & Asphalt Company is 50 gals. per 1,000 sq. ft.

Work proceeded rapidly. In less than three months' time, the contractors applied over 100,000 gals. of Walk-Top (black) in sealing a total of 150 different schools. Contractors Alta-Frazer Edwards and A. A. Veit, both of Los Angeles, report that a significant feature of the work was the ease and speed of application. An experienced applicator working an open area can squeegee from 50,000 to 60,000 sq. ft. per day in one application. The fibrated asphaltic emulsion is applied cold, which eliminates the need for heating equipment, and reduces the danger of fire hazards.

An interesting phase of the Los Angeles playground program was the letting of a special job in order that the asphaltic sealing procedure could be observed by conferees of the Association of School Building Officials, meeting in Los Angeles during October. The demonstration was held on 142,000 sq. ft. of playground at the Los Angeles High School. The program was arranged in order to allow the conferees to study each phase of construction. A section of unprimed pavement was left exposed so that oxidation and surface texture could be observed; one section of the pavement had been primed for paving in accordance with the specifications; a portion had received the prime and one application of the fibrated asphaltic material; the last section had received two applications and had thoroughly cured. Playing and directional lines were painted on the last section with aluminum paint. The final phase of the program was the actual construction operation, including the mixing, transporting, and spreading. Each step of construction was described to the group by Franklin Azbill, Supervisor of Paving and Grading, using a public address system.

The playground surfacing program now underway in the Los Angeles area is considered typical of similar, though less extensive, work in all parts of the country. The rapid growth of school population during the past few years has made it imperative that playgrounds be maintained in top condition for maximum use at minimum cost.

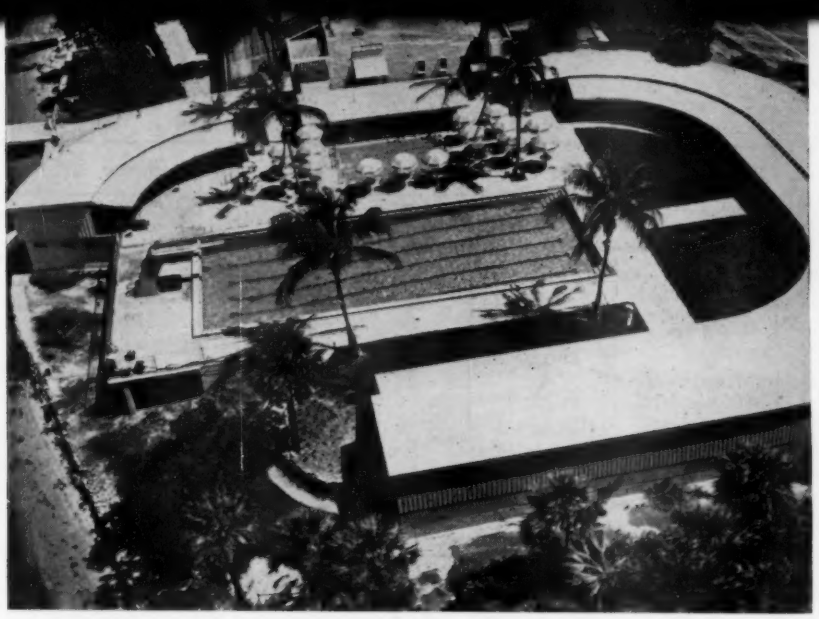
Since the completion of the first unit contracts, the Los Angeles Board of Education has let an additional 1,500,000 sq. ft. of play area for sealing with the approved asphaltic composition. It is contemplated that for every square foot sealed by the Los Angeles Board of Education, outlying districts in Southern California will seal an equal amount.

● **WALK-TOP mixture is spread evenly by this wheeled container, or from cans, just ahead of the squeegee crew, which follows immediately afterward.**

• • •

Zanotti Cement Bound Macadam

In a paper presented at the Italian Road Congress, held in Bolzano in April, 1954, a brief account is given of the use of "Zanotti" cement-bound macadam which is said to be sufficiently strong to be used as a surfacing and has lasted for over 20 years on some heavily traveled roads in Italy. Fairly large stone, 1½ to 3 in., is grouted with mortar having a high water-cement ratio. Penetration is carried out by vibration and the surfacing may be up to 8 in. thick. The surfacings, although slightly slippery, have been successfully used for streets with a gradient of 9 percent. They have shown high resistance to cracking and joints are required only at the end of each day's work. Tests on a surfacing which had been in use for 18 years showed that it had high compressive strength, and flexural strength. The construction costs of a cement-bound macadam surfacing are estimated at about 2/3 those of a comparable concrete slab. A paper by G. Stellingwerff, condensed in British "Road Abstracts."



● **WELL-DESIGNED and engineered swimming pool. Note clarity of water indicated by lane lines on pool bottom.**

ENGINEERING *a Swimming Pool*

HERBERT FEITLER

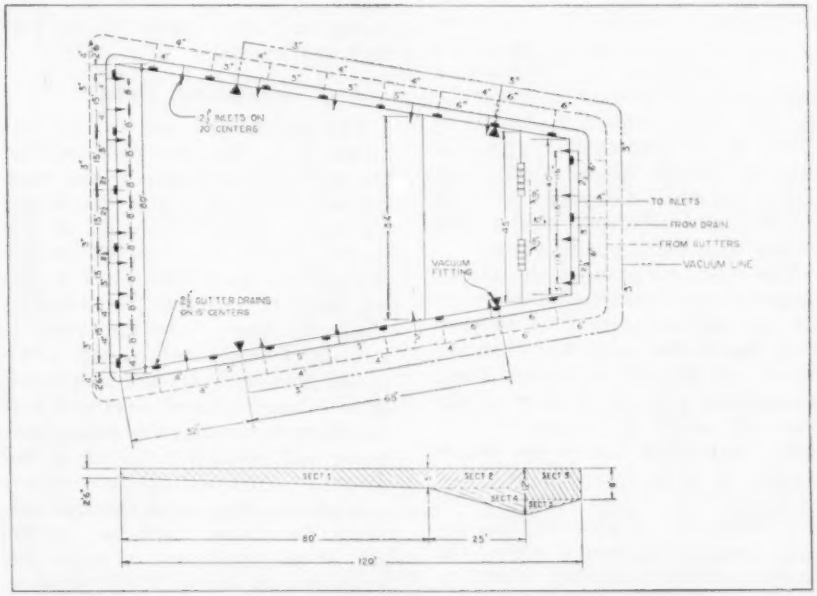
Sparkler Manufacturing Co.

Water Filter Division

SWIMMING pools have enjoyed increasing popularity since the end of World War II, and the services of city and consulting engineers for their design are in increasing demand. Many engineers have never designed a pool, and when confronted with the assignment find that it is a complex one. The days of the "old swimmin' hole" are gone, and the modern swimming pool requires a complete recirculation, filtration and purification system.

The minimum sanitation requirements vary from state to state, and the engineer should familiarize himself with the applicable state requirements. The American Public Health Association[1] publishes a pamphlet of recommended practices, and the State of Illinois "Sanitary Requirements for Swimming Pools"[2] is considered to be one of the better state codes.

To better illustrate the problems encountered in pool work the design of the recirculation system for a modern fan shaped pool will be considered. Other shape pools and pools with other filter room locations will require different design, and the following should not be regarded as a rigid specification.



● **FIG. 1. Plan and section of a swimming pool, with dimensions which permit easy calculation of the volume of water in it. See text herewith for procedures.**

The first step is to calculate the pool capacity in gallons. To do this the pool is divided into sections whose volume is easily computed. In Figure 1, the pool has been divided into five sections. The pool capacity is computed to be 278,500 gallons. Next the flow must be determined. State regulations should be consulted to find out the number of turnovers required per 24 hours. If four turnovers per day are required, then the contents of the pool must be recirculated every six hours. This is equal to a flow of 775 GPM.

Knowing the flow, the number and size of inlet fittings and outlet drains, and their header sizes may be determined. Outlet drains serve to drain the pool and to return water to the treatment plant. They are located at the deepest point of the pool, and the grates should have at least ten times the outlet pipe area. Two 8-inch drains joined to a 10-inch header have been selected.

It should be noted that two 6-inch drains joined to an 8-inch header might have been used. However, state regulations tend to become more strict, and at some future date a more rapid turnover may be required. It behooves the engineer to make provisions for this in the original piping. Many pools designed only ten or fifteen years ago are now operating on faster turnovers; which results in increased friction losses and, consequently, higher electrical consumption.

The same allowances should be made in the inlet piping. The system shown is one of several which might have been used; the main concern being that no dead spots (places where water does not circulate) exist in the pool. Water is returned to the shallow end of the

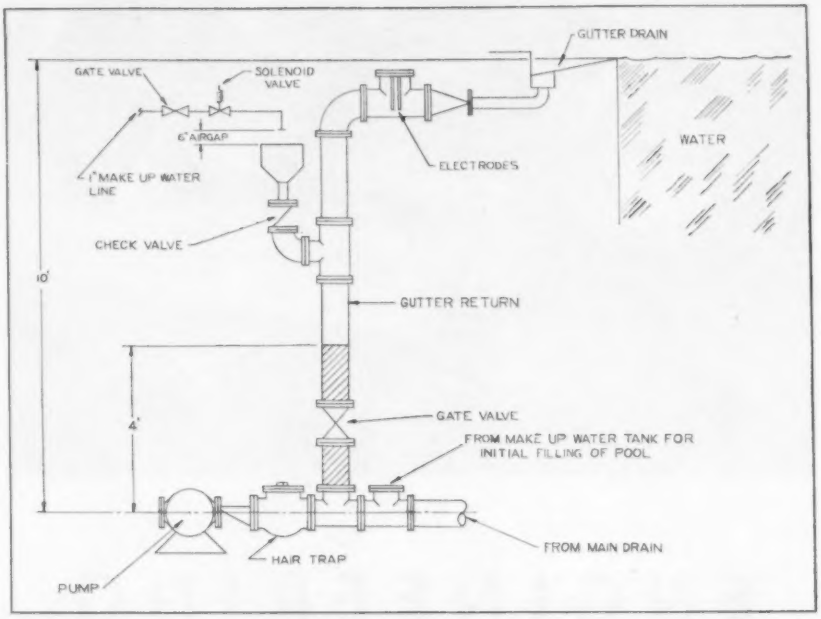
pool proportional to the volume of water between the shallow end and the main drain. This volume is represented by sections 1, 2, and 4 (Fig. 1) and is equal to 82.5 percent of the pool. Thus only 17.5 percent or 136 GPM of water should enter between the main drain and the deep end of the pool. The inlets should be adjustable from full open to full shut so that the flow may be balanced into the pool. The 4-inch line to the inlets at the deep end should be valved to prevent excessive flow to these inlets. High velocities at these inlets will result if this is not done.

There are several schools of thought regarding the distance below the water level the inlets should be placed. The trend is away from 10 to 15 inches below the surface to much deeper locations. In extreme cases inlets have been placed two feet from the pool bottom at the deep sections and as close to the pool floor as practicable at the shallow sections. Chlorine residuals are more easily maintained by deeper inlets and a minimum depth of 18 to 24 inches seems desirable.

Overflow or scum gutter drains should be located on 15-foot centers around the entire perimeter of the pool. A minimum size of 2½-inch fittings should be used. In sizing the header piping, thought should be given to the increasingly popular concept of the "closed system"—a system where the overflow water is purified and returned to the pool rather than being put to waste.

The main purpose of the closed system is the conservation of water. Of the pool capacity 7 to 10 percent may be lost each day when the water is allowed to waste. Cost, availability and the quality of the make-up water are factors to consider, but even where an ample supply of good water is available at no cost the closed system offers the advantage of providing an almost constant skimming action. On indoor pools an additional advantage is the heat saving resulting from the greatly reduced use of make-up water.

Many ways for recovering the gutter water have been proposed. They range from large balance tanks with mechanical floats to much smaller tanks using motorized valves actuated by relays and electrodes. Ideally the system used should recover all gutter water (with a bypass to the sewer for unusual conditions) and maintain the pool at a constant level. The system described below is believed to be the least costly and most easily operated of any now in use.



● **FIG. 2. Arrangement for maintaining pool level at constant elevation. Electrodes of equal length are placed to regulate the overflow from pool as shown in the sketch.**

Equipment Data

The equipment room is often located under the pool deck so that the recirculation pump works on a positive head. In Fig. 2 the height difference between the lip of the gutter and the pump center line has been shown as 10 feet. Thus, a static head of ten feet is available. When the pump is in operation, it will exert some suction, but a reduced positive head will still exist. An arbitrary reduced head of 4 feet has been shown, and this means that water will stand 4 feet high in the directly connected gutter return pipe shown. Because of this, air will never be sucked into the system and, at the same time, when water spills into the gutter it will increase the head of standing water which will then be preferentially taken away by the pump. This effectively recovers all the gutter water.

To maintain constantly the level of the pool a pair of electrodes, a relay, and a normally closed solenoid valve are used. It is desirable to skim the surface of the pool constantly to remove floating debris, and an overflow of about 15 percent of the recirculated water is used (the gutter header should be sized to handle twice this flow). To accomplish this, electrodes of equal length are so placed as to contact the water in the horizontal line when 117 GPM are flowing. In the 6-inch line shown the electrodes would be suspended to approximately two inches from the pipe bottom. When less flow occurred, contact between the electrodes would be broken, and the relay would open the solenoid valve on the make-up water line. The solenoid would remain open until the proper overflow was achieved.

Deck drains should be so located as to insure good drainage and resulting dry decks. The deck drains should not be connected to the gutter drains and should go directly to waste.

Vacuum cleaner fittings are usually sized to take a 2-inch hose fitting, and a minimum 3-inch header should be used. Such fittings should be located for the greatest operating convenience and should be placed about 12 inches below the gutter lip. Portable vacuum cleaners eliminate the header piping but have the disadvantage of wasting a great deal of water and requiring an electrical outlet in the pool area.

Cast iron around-the-pool piping is usually used, but where pipe tunnels are available galvanized or even black iron pipe is sometimes used. Because of the choice of piping and fittings, and local wage differences no cost estimate has been made.

In selecting the purification equipment little attention is given to the nature of the make-up water. Highly colored waters will be subject to chlorination in the pool and will

[1] Recommended Practice for Design, Equipment and Operation of Swimming Pools, etc. American Public Health Association, 1790 Broadway, New York, N. Y. 1949.
[2] Sanitary Requirements for Swimming Pools, Circular No. 126, Dept. of Public Health, Springfield, Illinois.

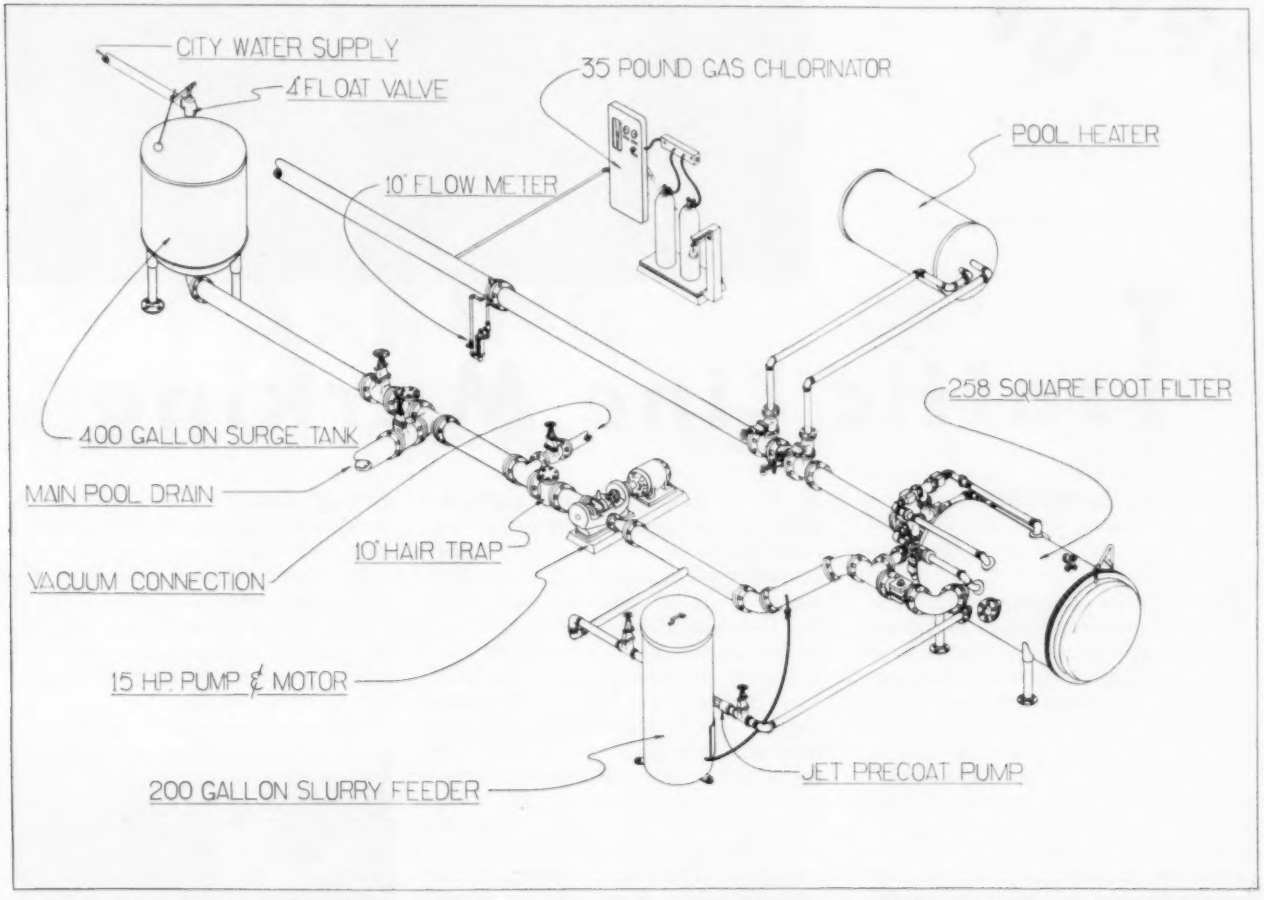
only be noticed when the pool is filled at the start of the season. Where high iron contents are found some thought might be given to aeration towers (depending upon how much iron is in solution) although the air gap between the city water line and the make-up tank provides an adequate aeration for most waters (Air gaps are required at all city water and sewer connections). Iron which does pass the filter will precipitate and settle out in the pool and may be vacuumed away.

dency for precipitate to build up on filter septa and also to deposit in the lines. Polyphosphate treatment appears to offer a solution to this problem.

For the reasons stated above, little attention is given to the makeup water, and the equipment is sized to handle the low turbidity water of the pool itself. The basic equipment used on recirculation systems is as follows: Filter, slurry feeder, recirculation pump, hair and lint catcher, make-up tank, flow meter, chlorinator and vacuum cleaner.

Since the recirculation pump usually has a 60-foot TDH (see below) the maximum pressure on the filter cannot exceed the pump shut-off of about 45 psi. Therefore, a 60 psi tank, sheet rubber-lined for rust and corrosion protection, may be used. Exposed metal parts should be of stainless steel.

An integral part of a diatomite filter is the slurry feeder. The accurate feeding of small quantities of diatomaceous earth keeps the precoat (initial coating) from plugging and is responsble to a great



● **ISOMETRIC drawing of typical equipment room: Filter and precoat pump, heater, chlorinator, surge tank and piping.**

High turbidites will shorten the length of run on diatomite filters, but the quality of the effluent will remain characteristically high. Immediately after filling the pool the turbidity should be about 1 PPM and after one day's recirculation it will be reduced to less than 0.1 PPM. On a six-hour turnover basis the turbidity should remain below 1 PPM almost regardless of the pool load.

Recently hard waters have been the subject of much speculation. Although cementation cannot occur in a diatomite filter there is some ten-

To handle 775 GPM a single diatomite filter having 258 square feet of filter area would be required. The filter would operate at a flow rate of 3 GPM per square foot of filter area, and average filter runs of five to seven days on indoor pools and three days on outdoor pools may be expected. A 258 square foot filter would have the following overall dimensions including the face piping: 9 feet long, 6 feet wide, and 6½ feet high. No head room is required for filter disassembly or the like, and the room need be no more than eight feet high.

extent for long filter runs. The slurry feeder consists of an open tank with an agitator and a positive displacement diaphragm type pump. This method of feeding is preferred since it does not rely on the suction side of the pump for introducing the slurry.

For precoating diatomite filters an ejector pump is connected to the slurry tank. It operates on water pressure from the recirculating pump and offers the advantage of keeping the slurry out of the recirculating pump.

(*Continued on page* 212)

Springfield, Illinois.

complish this, electrodes of equal

chlorination in the pool and will

● MOTORIZED traffic line markers have greatly speeded up the process of street striping in Jacksonville, Fla. Daytime marking is the rule because the paint dries in 30 minutes at 65 degrees but takes longer at night.

SPEEDING UP

Traffic Line Marking

C. E. WRIGHT

THE JOB OF painting traffic lines on streets and manufacturing traffic signs has been a function of the Police Department of Jacksonville, Fla., ever since the automobile age made such things necessary. This work comes under the traffic department, headed by Inspector D. K. Pate. In the rear of Police Headquarters is a paint shop, in charge of Sergeant H. W. Powers, where a mere half-dozen men do all of this work, although this work has more than tripled in the past ten years because of traffic expansion.

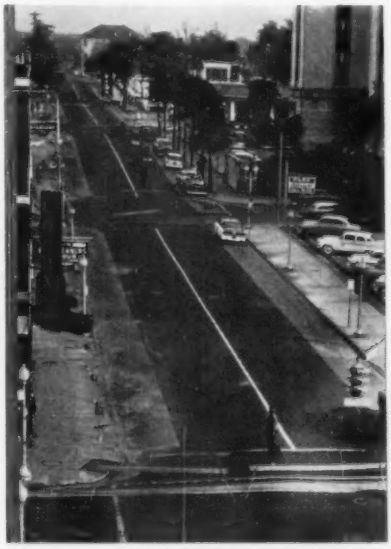
Although in many cities such work is handled by the traffic engineer, there has been no suggestion in Jacksonville of taking it away from the police department, which has worked out a technique for doing the street marking job without seriously disturbing traffic. The Police Department, however, works in close harmony with Harry Howard, city traffic engineer, who frequently makes the suggestions as to where such markings are needed.

Most of the center line and crosswalk striping in Jacksonville is done at night, when automobile traffic is lightest, although Inspector Pate leans to the view that "we would be better off if we did it all in the daytime." A reason for this is that the Bee-Line Compound, a reflectorized paint, manufactured by the Minnesota Mining & Mfg. Co., which Jacksonville uses, dries in 30 minutes if the temperature is 65° or higher, but night temperatures in Jacksonville during the winter months are usually lower than that.

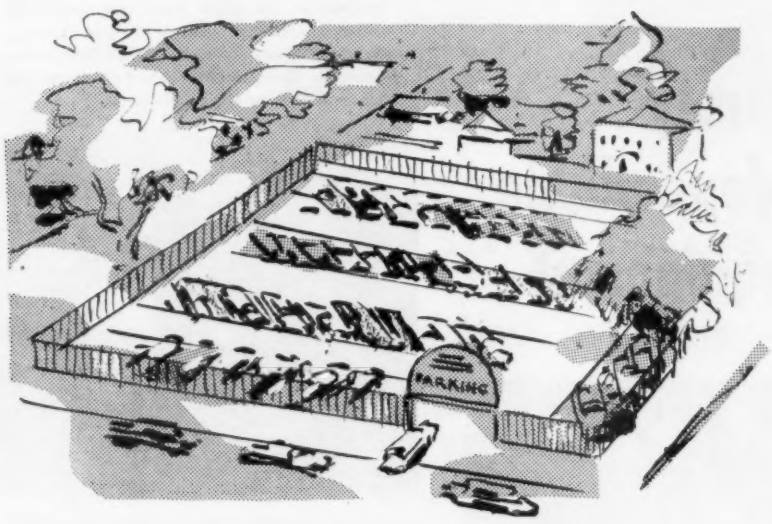
By shutting off traffic, a block at a time, and using a Kelley-Creswell street marking machine, eight men are able to do in an hour what it would take two men all day to do. The machine is operated by one man, but the others are employed to set up barricades and divert traffic temporarily while the job is being done. Traffic policemen assist in the traffic diversion. The machine travels at 3.2 miles an hour, using one gallon of paint for each 300 lineal feet of 4-in. wide stripe.

As an example of increased wear from heavier traffic, it is now necessary for the city to use from 1200 to 1500 gal. of paint a year, whereas a decade ago it was only a third of this; 33 miles of principal city streets require re-striping every six to eight months, as against a service of 15 to 16 months on less-used streets. Crosswalk striping is done with a hand spray gun.

All traffic signs are made in the Police Department paint shop. A few are hand painted, but most of them are produced by the silk screen process, the shop also making its own stencils.



● ON MAIN traveled streets, the traffic line lasts 6 to 8 months.



OFF-STREET PARKING:

Problems and Remedies

IN a comprehensive article on "Off-Street Parking," Ohio Cities and Villages, organ of the Ohio Municipal League, presented data on the problems occurring in various Ohio Cities and described some of the remedies adopted. The following data are condensed from that article.

MARIETTA—When the first signs of a greater demand for parking were witnessed the city paid little attention, but as the problem became more acute, the city leased a small portion of unused ground from one of the railroad companies. This land was given just enough treatment to withstand the weather and opened as a free parking lot. It wasn't long until it was deemed advisable to enlarge the lot and install parking meters. More space was acquired and a blacktop surface applied; 40 parking meters giving one hour for 5 cents were installed and the lot was opened at a total cost of $5,000. Since its opening in June, 1952, the lot has completely paid for its construction and now affords the city an annual revenue.

One lot was not the answer to Marietta's parking problem. Two other sites are under consideration for development at present. The proposed plan calls for some fill to put the proposed area in condition for hard surface, the finish being either blacktop or concrete. Modern lighting is planned to make the lots more desirable for night parking. The estimated cost of the two facilities is $50,000 and they would provide parking spaces for approximately 230 cars.

ALLIANCE—One of the few cities in the country to say "We have no parking problems in the downtown area" is Alliance. The city has arranged parking facilities to provide for future growth. In addition to a lot located in the main business district, which accommodates 33 cars, the city has two other lots under construction which will, combined, provide space for another 75 vehicles.

Located two blocks from the square in Alliance is a Minit Park. This six-tiered structure delivers cars by elevator. It will handle 68 cars. Hourly rates for the structure are 25 cents for the first hour and 10 cents per hour thereafter.

All of the parking facilities in Alliance were constructed at a total cost of $124,000. General obligation bonds were sold to finance the work. Bonds will be retired from revenue received from the 108 parking meters on the three lots and revenue collected from the Minit Park.

ATHENS—Early in 1953 Athens recognized the need for additional parking facilities and negotiations were commenced for two sites located in the business section within one-half block of the main street. One of the most pressing problems was the high cost of real estate in addition to the cost of clearing buildings from the proposed sites. For this reason the city selected the smaller of the two sites and acquired it at a cost of $47,000. The plan calls for a deck level structure which eventually would triple the present capacity.

Athens financed its off-street parking through a local bank with half of the parking meter revenue pledged to secure the loan.

LORAIN—In planning a study of the Lorain parking problem the city organized a Parking and Traffic Safety Committee consisting of merchants, realtors, representatives of industry and members of council. The principal function of the committee was to determine the best approach to eliminate the normal congested condition of city streets.

Consulting engineers were hired to survey the problem in two phases. The first phase was limited to the downtown area and the second phase covered the central and south Lorain area. Since the study started in 1953, the first phase has been completed and the resultant action taken by the city was construction of off-street parking facilities with space for approximately 400 cars. Cost of the project was $320,000 which included acquisition of land, removal of buildings, purchase of parking meters, curbs, drainage, lighting, signs, painting and surfacing. The city currently owns six off-street parking lots.

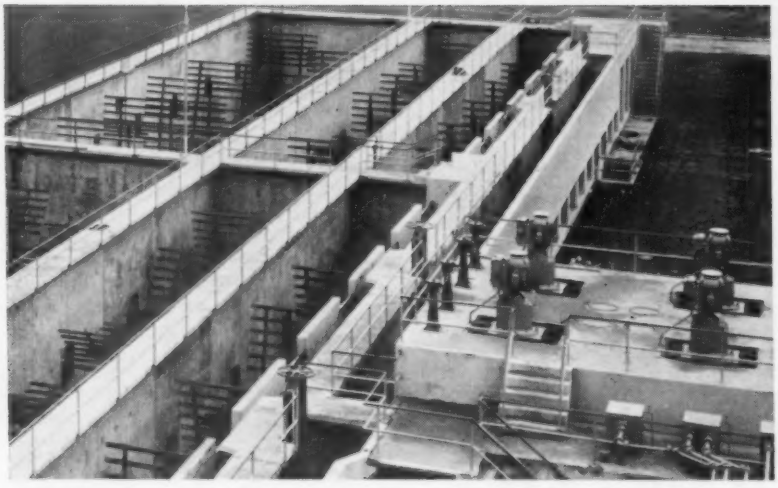
The final report on the second phase of the study has been completed and submitted and it is planned to add 120 parking spaces in the central and south portions of the city.

The off-street parking program in Lorain was financed by mortgage revenue bonds which will be retired from revenue collected from the parking meters in the city. Parking meter money above that needed to retire bonds is used to operate the Lorain Parking Meter Department.

NORWOOD—The parking requirements of Norwood were complicated by high industrial employment, active retail traffic and a compact residential area. The city made provisions for off-street facilities designed to eliminate parking on the

(*Continued to page* 176)

Hundreds of cities rely on JEFFREY for dependable water treatment equipment



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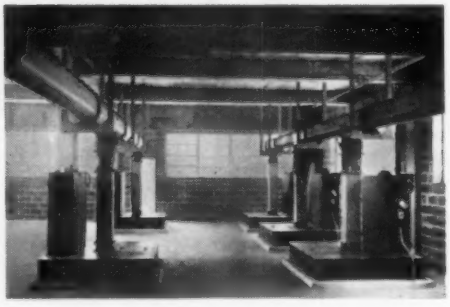
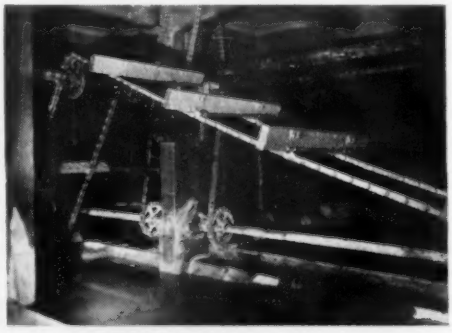
Below: Jeffrey Spiral Conveyors carry chemicals from storage bins by bucket elevators to chemical feeders.



Below: Close-up of Jeffrey Sludge Collectors in action in the settling basins at large water treatment plant.



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APWA News

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Cost Accounting Manual Now Available

New Publication Prepared with the Cooperation of APWA Cost Accounting Committee

A practical manual of instructions for the use and guidance of municipal officials who desire to install and maintain public works cost accounting systems has just been released by the Public Administration Service. This new publication was prepared with the cooperation of the American Public Works Association Committee on Cost Accounting.

The system outlined in the manual is complete with respect to account classification, forms, records, procedures and cost reports and statements. It is designed for manual operation but can readily be adapted to mechanical operation in those cities which have bookkeeping machines or other accounting equipment available for use in the cost accounting process.

The account classifications and procedures outlined in the manual can easily be modified to meet the needs of virtually all small and medium size municipalities. Special installation or adaptation assistance can be obtained from the Public Administration Service on a cost basis. This non-profit service agency is governed by the executive officers of several national organizations of governmental officials and agencies, including the American Public Works Association. It maintains a large permanent technical staff trained and experienced in various phases of governmental operations. Estimates of the cost of such service will be submitted upon request to the Public Administration Service, 1313 East 60th Street, Chicago 37, Illinois.

The APWA Cost Accounting Committee which reviewed this publication consisted of the following members: Richard Gallagher, Director of Public Works, San Diego, California (Chairman); James J. Murray, Superintendent of Public Works, Colorado Springs, Colorado; Fred M. Galloway, Town Engineer, Montclair, New Jersey; Reed McKinley, Director of Public Works, Kansas City, Missouri; Harry O. B. Bellinger, City Engineer, Columbia, South Carolina; Robert L. Anderson, Superintendent of Public Works, Winnetka, Illinois; Albert Wyler, Director, Department of Streets, New Orleans, La.; Kenneth K. King, Director of Public Works, Phoenix, Arizona; and Walter Swietlik, Commissioner of Public Works, Milwaukee, Wisconsin.

This 8½ x 11 inch 97 page publication entitled—Municipal Public Works Cost Accounting Manual, is available at the price of $3.00 per copy. Members of the American Public Works Association, however, may purchase this new publication at a special discount price of $2.00 per copy. Orders should be sent directly to the APWA headquarters, Chicago.

Service Award Committee is Re-appointed

John S. Flockhart, Business Administrator for the City of Newark, New Jersey, was recently re-appointed by APWA President Warren A. Coolidge, to the Chairmanship of the Samuel A. Greeley Service Award Committee. Also re-appointed to this Committee was William J. Galligan of Los Angeles, California, who is an Honorary member of the Association and first president of the International Association of Street Sanitation Officials —a predecessor organization of the APWA. The third member re-appointed to this Committee is Mark B. Owen, Vice-President of Nichols Engineering and Research Corporation, Indianapolis, Indiana.

Eligibility for the Award requires five years of membership in the Association and thirty or more years of service with the same municipality. The presentations will be made at the close of the 1955 Public Works Congress and Equipment Show in Milwaukee, Wisconsin, October 2-5.

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Officers Elected for New Research Foundation

W. A. Hardenbergh, President and Editor of Public Works Magazine, New York, New York, was elected Chairman of the Board of Trustees of the Association's newly organized Research Foundation. (See announcement in the APWA News Section of the March, 1955 issue of this magazine). Other officers elected were, Edward J. Cleary, Executive Director, Ohio River Valley Water Sanitation Commission, Cincinnati, Ohio, Vice-Chairman; and Professor Earnest Boyce, Chairman, Department of Civil Engineering, University of Michigan, Ann Arbor, Treasurer. Plans for financing several projects now under consideration will be announced in the near future.

Chapter Activities

Norman C. Raab, Projects Engineer, Division of San Francisco Bay Toll Crossings was the guest speaker at the April meeting of the Northern California Chapter. He discussed some of the problems encountered in the design and construction of the Richmond-San Rafael Bridge. A special field trip to inspect this, the second largest bridge in the world, was arranged for the members who were especially interested in this project.

Members and guests of the Michigan Chapter met at Huck's Inn, on the outskirts of Detroit for a luncheon meeting, April 21st. J. G. Schaub, Special Assignment Engineer of the Michigan State Highway Department, discussed the administrative aspects of Act 51, of 1951 which governs the distribution of state collected locally shared motor vehicle taxes.

The April Meeting of the Philadelphia Metropolitan Chapter also featured a "bridge talk". Daniel M. Kramer, Chief Engineer of the Delaware River Port Authority gave a very interesting talk on the new Philadelphia-Gloucester Bridge following a dinner meeting of that Chapter at the Engineer's Club of Philadelphia. This new bridge is expected to be opened in 1957. The talk was followed by the presentation of a motion picture on the activities of the Port of Philadelphia.

The San Diego and Imperial County Chapter held its Spring meeting in the Marine Officers' Club at San Diego, on April 28th. The entire day's program was devoted to a discussion of problems involved in the planning and construction of subdivisions. The viewpoints of subdividers and land planners were expressed at the morning session, while engineering and construction problems were discussed at the afternoon session.

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*Woodward, 1952, EHC Activity Report 11:13 Jan.-Mar.
†Collet, Johnston, Ey, Croft, 1953 J. Amer. Public Health Assn. 43:1438-40 November.

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Coolidge Appoints Nominating Committee

Milton Offner, Secretary, Board of Public Works, Los Angeles, California and Immediate Past President of the Association, has been appointed Chairman of the Nominating Committee by President Warren A. Coolidge, Director of Public Works, Nashville, Tennessee. Other members of the committee are: Fred M. Galloway, Town Engineer, Montclair, New Jersey; William A. Xanten, Superintendent, Division of Sanitation, Washington, D. C.; Ralph C. Graham, Superintendent of Construction and Public Works, Davenport, Iowa; and Marion E. Boriss, Assistant Director, Department of Public Service, Miami, Florida.

• • •

Lagoon Disposal in Minnesota

The first lagoon type sewage disposal system in the state was recently put into operation at Albany, Minn. The total cost including the construction of a lift station, land, and overhead expenses was $185,000.

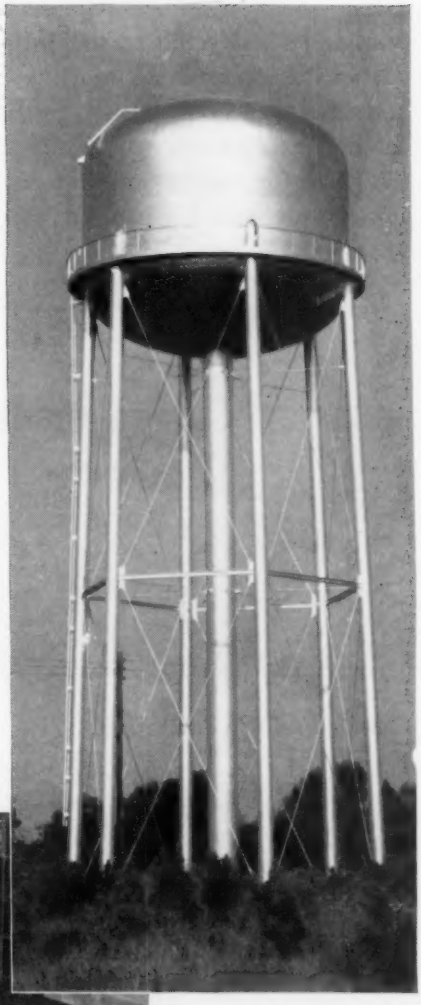
• • •

Turnpike Tolls are High but Worth While

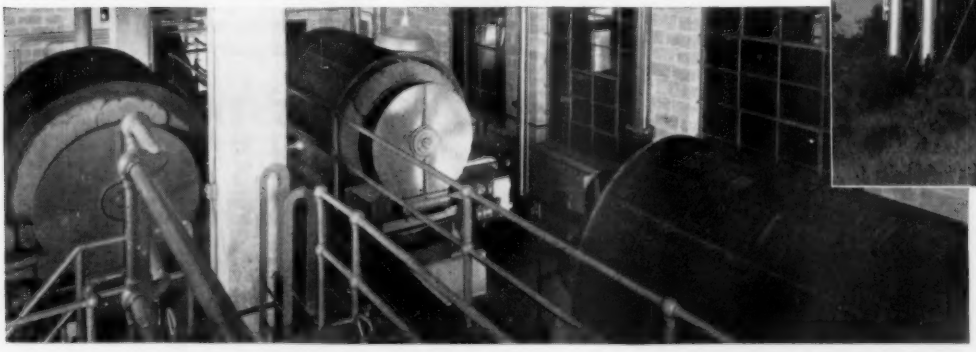
The average charge of about 1 cent a mile paid by drivers of passenger cars represents approximately a 12 or 15-cent per gallon gasoline tax, based on a normal gasoline consumption. Large trucks may pay several times as much—as high as 6 cents a mile. In both cases, saved time, greater safety and other factors make up for the extra cost.

Headliners in Municipal Service

Over 2,000 tons of various sludges and industrial wastes are dewatered daily on Conkey Sludge Filters. From Maine to California, Horton® elevated tanks, in capacities to 3,000,000 gals., are providing a dependable gravity pressure water supply that is helping municipal water systems meet peak load periods and reduce pressure variations. These headliners are providing dependability, economy and trouble-free service in large and small municipalities. Write the nearest CB&I office for further information on Conkey Sludge Filters and Horton elevated tanks.



Shown above is a 200,000-gal. Horton ellipsoidal-bottom elevated water tank, 74 ft. 6 in. to bottom, installed for municipal water service at Center, Texas.



Shown above are typical Conkey Filters dewatering primary sludge.

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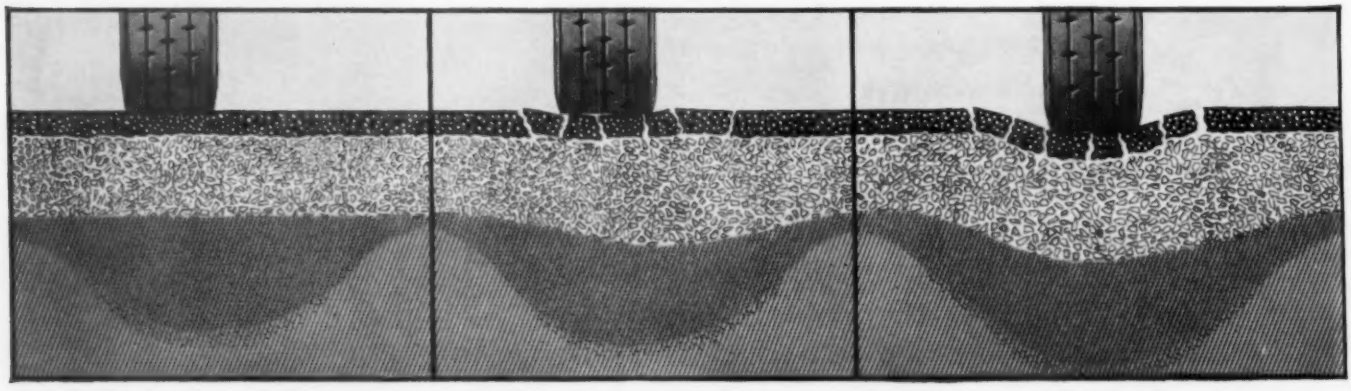
Build YOUR Streets with a FOUNDATION . . . at low cost with a SEAMAN

Sub-grade soil stabilization with the SEAMAN MIXER is economical, quick and easy to do — and adds years and years of life to the base course. It cuts maintenance so sharply that the dollars budgeted for road repairs will pay for many miles of new and better highways.

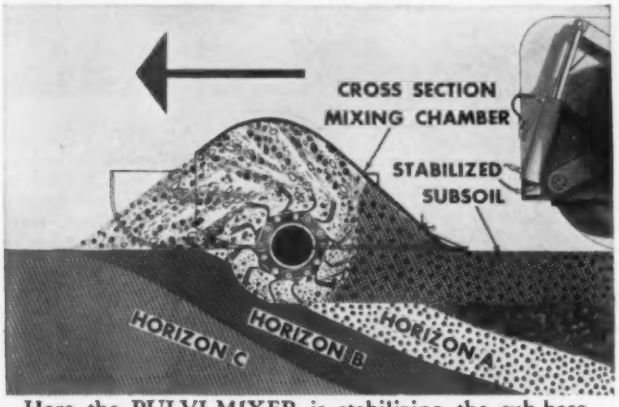
And, of course, if you up-grade the quality of your sub-base soil by mixing it with gravel or gravel and binder, your maintenance savings are proportionately larger and extend over an even greater number of years.



Sub-base failure is caused by soils of different natures reacting unevenly to moisture. Here a weak spot is developing in an *unstabilized* base. SEAMAN stabilization prevents this.

The breakdown of the soil in the sub-base through the disintegrating effect of moisture causes a localized movement and weakening in the base above.

As traffic pounds the base, cracks appear and the sub-base is weakened further by traffic loads and by permeation of additional moisture. The bridging effect of the base can no longer carry the load.



Here the PULVI-MIXER is stabilizing the sub-base by blending the different soils (soil horizons A,B,C) to attain a course which is uniform in moisture, density and thickness. Weak spots will not develop and the base above will withstand years of traffic punishment.

BLEND AND ASSEMBLE SUB-GRADE SOILS FOR MAXIMUM STRENGTH WITH THE SEAMAN

Sub-grade soils vary in physical characteristics and consequently in their reactions to moisture. It is their unequal movement and the presence of undesirable voids that cause heaving, pot-holing and breakup of the pavement. But one low cost pass with the SEAMAN blends and assembles those soils to uniformity in character and strength. This well-processed soil will reduce frost-boils, spring break-up and pavement failure.

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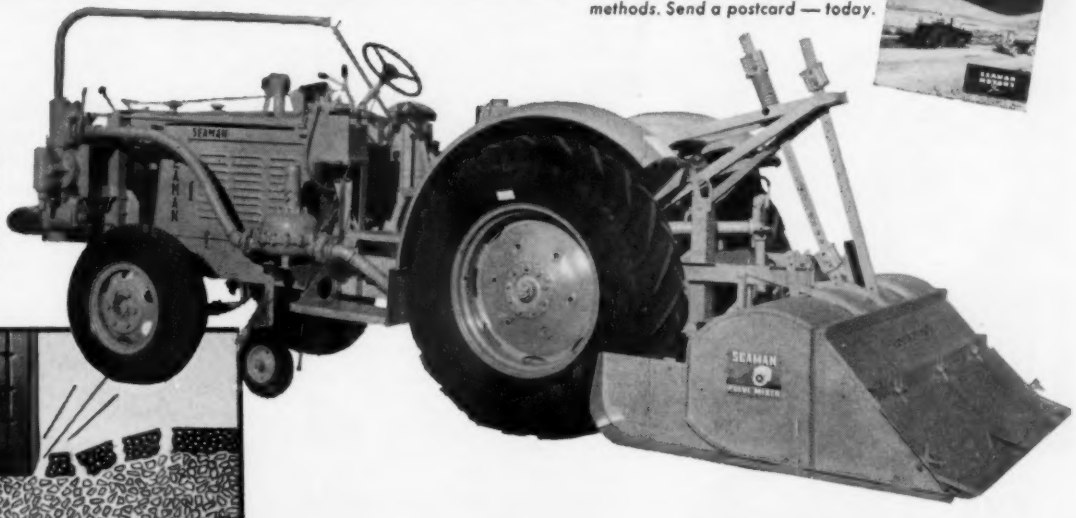
that will support a wearing surface!

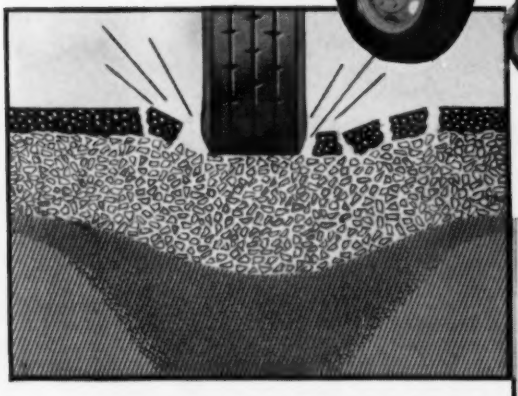
PULVI-MIXER

For a complete description of the SEAMAN TRAV-L-PLANT and the SEAMAN Self-Propelled PULVI-MIXER write for Bulletin TPS. It shows many field scenes and describes SEAMAN mixing methods. Send a postcard — today.

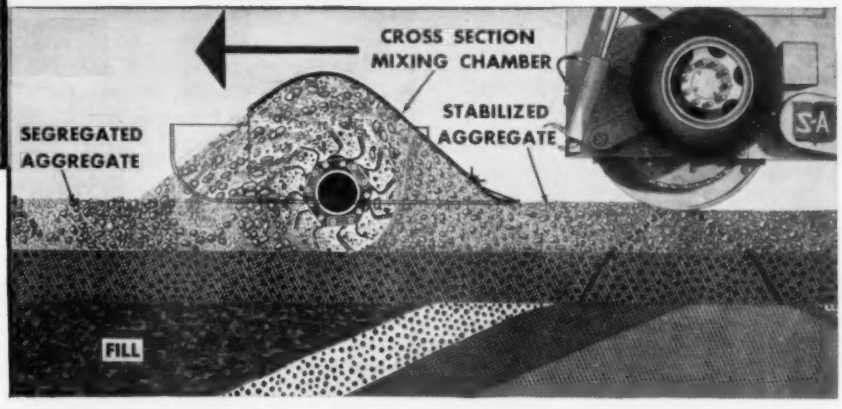
The Seaman TRAV-L-PLANT.

7 ft. mixing width; gasoline or diesel powered. Equipped with pump, tachometer assemblies, volumetric meter and spray bar for precision application of bitumen or water.





Complete breakdown of the base has started a chain reaction as more and more moisture permeates the fault and establishes repeated breakdown cycles along the width and length of the pavement.



. . . AND MIX THE BASE ITSELF WITH THE SEAMAN

No matter what materials — gravel, crushed stone, sand-clay, or native aggregates of any type; *no matter* what binders — bituminous, cement or chemical additives, — there is no equipment other than the SEAMAN that will blend, mix and assemble the materials so that the unstable segregation of coarse and fines is corrected. There is no other equipment that will so uniformly, quickly and completely distribute the binder throughout the mix. And SEAMAN-mixing costs are so low that only actual experience makes them entirely believable.

The SEAMAN PULVI-MIXER is processing the aggregates for the base course, correcting an always-present segregated condition — (the separation of coarse and fines). When the PULVI-MIXER has finished the work of blending and mixing the materials into a correct assembly, partially pre-compacted, the mix is ready for final rolling.

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A County Highway Weed-Control Program

LESTER N. PRICE,
Board of Chosen Freeholders
Sussex County, New Jersey

AS a farmer I have had for many years a compulsory and vital interest in weeds; as an elected representative of the people of Sussex County, New Jersey, I have had a like interest in public health, in public safety and in the wise expenditure of public funds—and as a human I have had a natural interest in beauty. Thus, when it was first proposed that all of these separate interests could be well served by the single act of spraying roadsides with herbicide, I found a new interest; though it struck me as one whose potentialities were being at least mildly exaggerated. Even in this age, when the youngest one of us can recall as fantastic the notion that we might one day sit in our livingrooms and see things happening a thousand miles away, it seemed that too much was being attributed to this chemical cure-all.

But, as our Board and Supervisor of Highways began to examine the idea more closely, to take each of the suggested benefits and hold it up to the light of our knowledge, it became increasingly clear that it deserved a try.

Presented at the Public Health Section of the Ninth Annual Meeting of the Northeastern Weed Control Conference, New York City, January 6, 1955.

It might be of interest to you to know what benefits were suggested and how we eventually examined them. The benefits were these:

1. Chemical weed-control will cut mowing and other roadside maintenance costs.
2. It will greatly decrease the number of cases of poison ivy among highway maintenance personnel and among other citizens and their children.
3. It will eliminate ragweed from the roadside and thereby decrease the possibility of hay fever attack among all citizens.
4. It will stop the growth of plants that obscure the highways themselves and render the roadside accessible to pedestrians and motorists in trouble.
5. It will aid agriculture by eliminating the highway weeds that may reinfest crop areas.
6. It will decrease mosquito breeding by creating weed-and-brush-free roadsides, thus permitting ditches to drain and drv more readily.
7. It will create a beauty heretofore unseen on most rural roads.
8. It will aid in the removal of snow.
9. It will conserve wild life by eliminating the cover that lures animals to the roadside area.
10. The complete service may be bought for less money than is now being expended on the unnecessary portion of the mowing operation alone.

If you are not aware of any of these virtues of chemical spraying, you will be able to appraise our suspicion upon hearing this barrage of wonders that were to be ours for the mere willingness to save money. But, when each feature of the proposed spraying program was separately and seriously examined in face of the known fact that these chemicals kill weeds and woody growth, while actually encouraging the growth of grasses, each feature became a simple, logical conclusion; provided, of course, the spraying program was reasonably conceived and carefully executed.

This latter consideration was very important to us, since whatever we lacked in information on the particular virtues of roadside spraying was, you may be sure, more than compensated for by an abundance of misinformation on the evils of such a program.

The program proposed called for three sprayings during each of three seasons to permit the most rapid development of sound turf by way of the persistent destruction of the ever-invading weeds and woody plants. When the nature of various plants in our area was examined, that program seemed to be sound. It left no opening for anyone's being deceived, disappointed or subject to public criticism. It consisted of blanket spraying of the entire roadside areas back to the fence lines or to the lines at which the roadsides are generally maintained.

We have completed our first year of the program and have enjoyed a fascinating operation.

The chemical is applied from a moving vehicle, having a right-hand drive and four remote-control noz-

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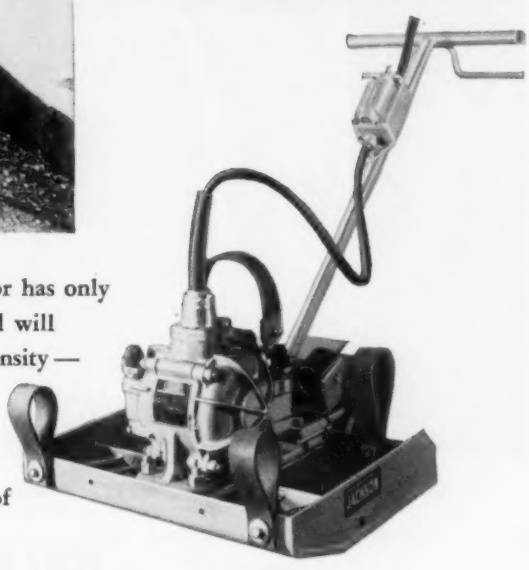
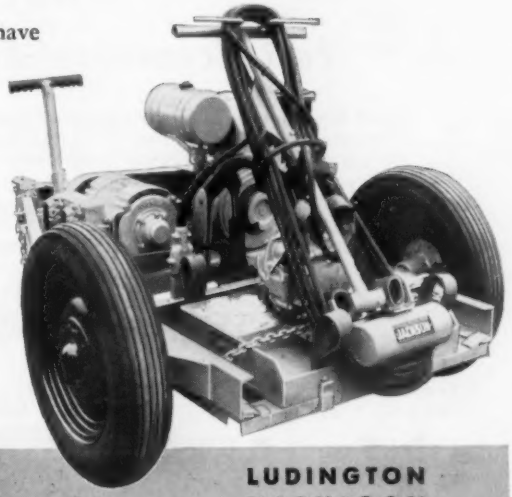


The compactor member of this outfit is self-propelling, the operator has only to guide it. It delivers up to 4500 1¾ ton blows per minute and will compact bituminous mixes in 4" to 5" layers close to maximum density — at the rate of 1800 to 2000 sq. ft. per hour. The compactor is operated from a Jackson Power Plant on the auto trailer, and since the trailer has a device for quickly picking up the compactor, it is a very mobile outfit, ideal for the many changes of location required in street patching. It is also very widely and successfully used for paving drives, walks, railway crossings, platforms and similar applications. Both Compactor and Power Plant have thoroughly demonstrated their ability to provide continuous, day in and day out service with a very minimum of maintenance.



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For compacting granular soils in sub-bases, in trenches and back-fills the Jackson Compactor is a natural. With it densities in excess of 100% of that specified are readily achieved at the rate of 2000 sq. ft. per hour in layers as thick as 10". You'll save many times the cost of this outfit in your first season's use of it. Let us give you the name of the nearest Jackson Distributor where you may see it, or detailed information, if you prefer.

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zles mounted vertically at the right front end. This equipment is called the "Multifix." It is produced by McMahon Brothers at Binghamton, New York, and is operated by one man who is both driver and operator of the spray equipment. The vehicle carries 1000 gallons of finished spray and several days' supply of chemical. It operates at low pressure in the spraying operation and at high pressure for refilling the main tank from any roadside stream. It is well-engineered for maximum safety and economy and is most surely responsible for the low cost at which this service is brought to our highways.

The results of the first year's work have been most gratifying. We had relatively weedless roadsides from the very first spraying and greener and healthier grasses than we had bargained for. The single mowing after the grass went to seed in the spring was all that was required during the entire growing season; and that one mowing was accomplished in one-third the time it would normally have taken had the weed bulk not been eliminated.

On the roads that were sprayed, there was not a single case of poison ivy or hay fever reported among our maintenance personnel, though in a normal season we would experience eight to twelve cases of such disability, each lasting from one to two weeks.

As for conservation, only occasional small game, such as rabbits and woodchucks could be observed on the roadsides, and these could be clearly seen on the grassy areas in plenty of time for motorists to guard against their sudden actions. The same can be said of children.

The work was neatly done. The line of spray was sharply cut at the far edges of the rights of way and left no unwanted appearance.

There were three reports of damage to private property, none of which was serious or cause for criticism of the operator. Each case involved hidden or informal plantings within the highway right of way. Two of these occurred in our beautiful lake resort area where most plantings are informal and spraying most exacting. The contractor investigates each report and repairs the damage to the satisfaction of the owner. It is understood that the contractor's experience to date shows less than one report of damage per thousand miles of spraying operation.

Such facts are of vital importance to anyone contemplating a spraying program. For the whole matter seems to require assurance of good results and of public acceptance.

In Sussex County, the general reaction has been more than gratifying. Representatives of State and local governments, of universities and agricultural agencies have visited our County to inspect the work. As far as I know, all have been favorably impressed with one or another phase of it; such that it is difficult to say which of the many virtues I have listed for this highway spraying program is of paramount importance.

The Highway Supervisor sees in it the elimination of many of his nuisance problems and a substantial saving in maintenance expenditures.

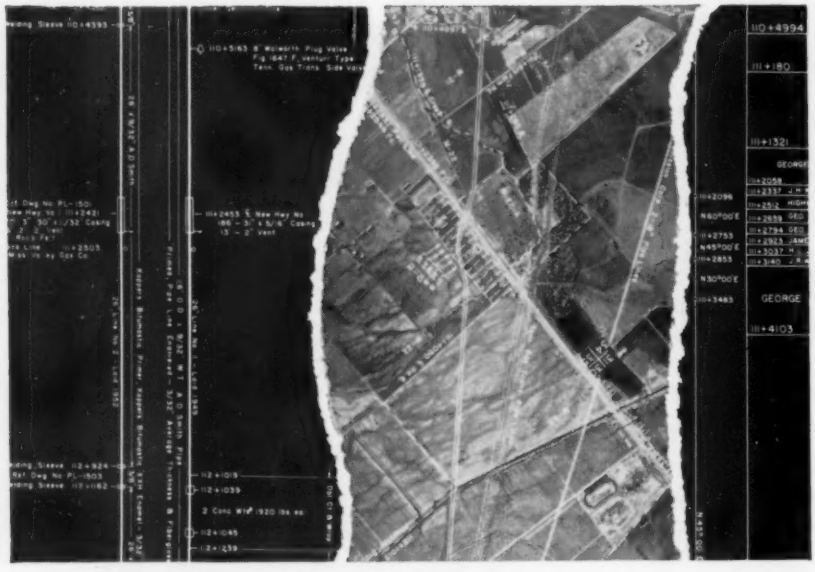
The conservationist sees benefits to game, soil, water and forests.

The agriculturalist sees in it benefits to crops; and, more especially, education of the farmer in the further use of these chemicals in the fields and hedgerows.

Commerce officials see in it an opportunity to advertise all of its virtues for their State.

Health officials see the end of plant poisonings along that great

Construction Starts Sooner...



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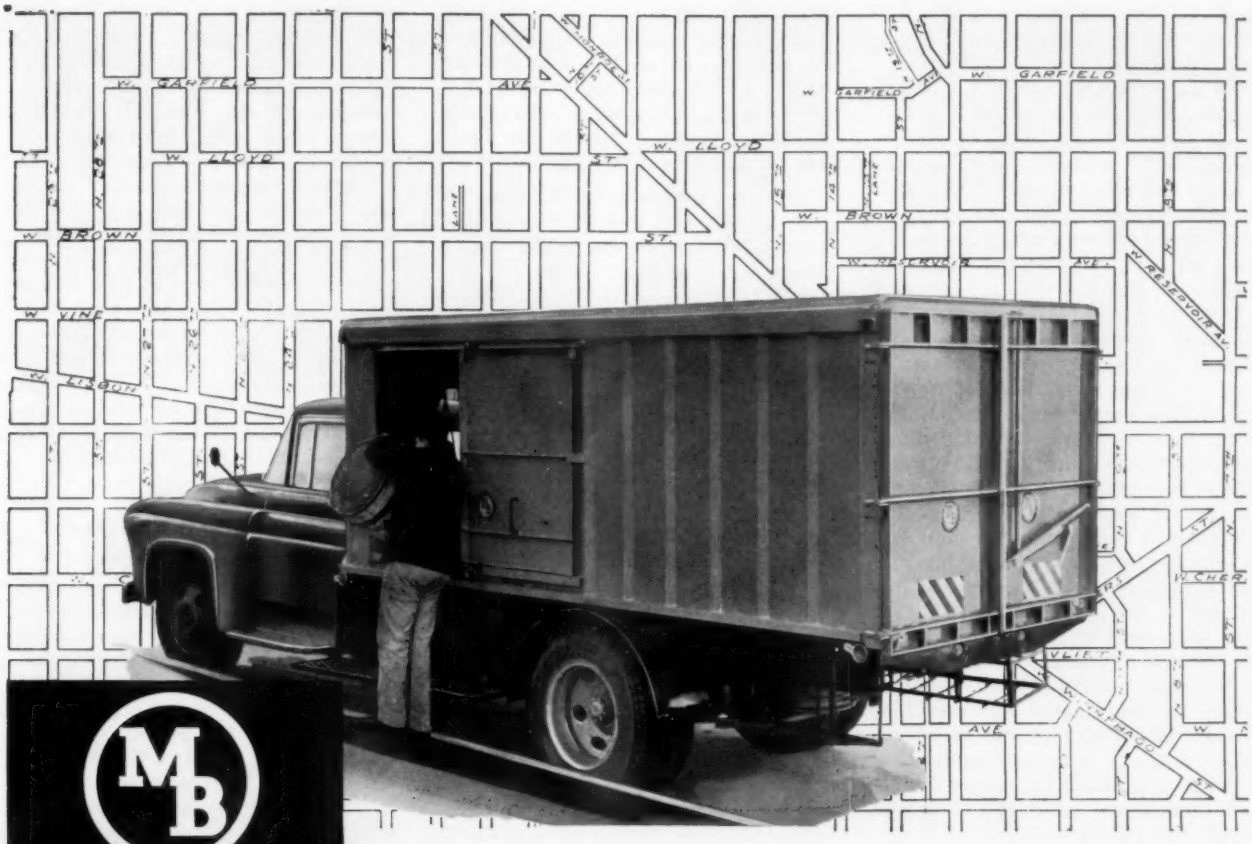

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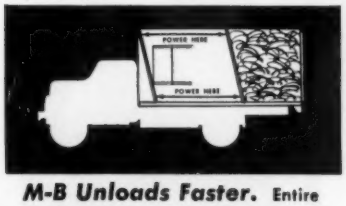
M-B Packs Faster. **Complete packing cycle takes only a matter of seconds. Powerful compaction means far fewer compaction cycles per load.**



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Powerful compaction permits packing more tons per load — means fewer "dead" runs to dump and back. M-B Bodies load faster and handle a huge volume before it is necessary to compact — resulting in fewer time-consuming compacting cycles — saves time, wear and tear on mechanism, and fuel.

Before selecting your next collection unit, get all the facts on the M-B Packer — remember — *it's the number of collection stops per day that counts*

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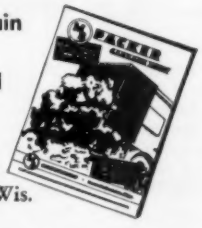

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expanse of roadside acreage that marks the responsibility of all public officials.

It need not be called a highway program. It can be justified as well as a conservation, farm, commerce or health program. In any case, the cost to the taxpayer is nothing. One benefit cannot be had without accepting all others; and all are available at a definite saving of public funds.

I believe, after witnessing at first hand the work in our county, that this process of destroying poison ivy and ragweed will spread rapidly throughout every State to the end that these will be eliminated along our highways and in other areas that are within the public charge. Taking a backward glance at the problem, it seems most strange that we should only now be looking forward to the attack on these plants when in fact the chemical sword has been well within our reach, for the past ten years.

Perhaps no State has done so much in coordinated research into the problems of highway weeds as New Jersey. A great amount of data is available in several pamphlets issued on the subject by our State Health Department at Trenton. The subject is well covered and nothing appears that does not in one way or another confirm the facts that I have expressed here. Accordingly, I repeat, we can surely expect statewide action in the manner of roadside spraying.

Of great interest are the facts that our poison ivy is being gradually eliminated and that ragweed seems simply not to appear at all. In addition, highway safety is increased, and there are substantial bonuses to agriculture and conservation.

• • •

Construction of Crushed Stone Road Bases

A paper by G. D. Grainger in *Highways & Bridges* describes a method recommended by the British Road Research Laboratory, Harmondsworth, for laying crushed stone road bases. A layer of coarse material, usually 2-2½ in. stone, is laid by means of a towed spreader box, which gives greater output and more accurate control of thickness than a bulldozer; for large-scale road construction, the use of a self-propelled machine is recommended. The coarse layer is followed by a layer of fines, spread by a gritting attachment to a lorry, the proportion varying according to the size and grading of the coarse stone, but generally being 20 to 40 percent. Compaction is effected by two passes of a heavy vibrating-plate compactor used in conjunction with a heavy smooth-wheeled roller which causes the fine material to settle into the voids. Further fines are added as compaction proceeds so that no loose patches deficient in fines remain. Experiments have shown that the compaction obtained by this method is equivalent to that normally produced after eight weeks' compaction by traffic, thus permitting the bituminous wearing surfacing to be laid immediately.

• • •

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"Vibration strips" have been used by the Colorado Highway Department to cause drivers approaching construction to slow down. These are diagonal seal coat, stone-chipped stripes on the road. They do not interfere with the operation of the cars, but as a result of their use no construction barricade was hit in any manner four weeks after their installation.

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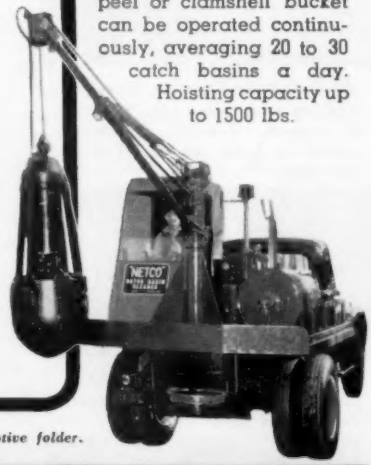

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Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

Public Works Planning—The Joint Economic Committee of the Congress recently released its report in which unanimous recommendations for "increasing public works," were stressed. The Committee, chairmanned by Senator Paul Douglas, said that "Federal, state and local public works are needed to meet the needs of a growing population, expanding economy and national security." Following the conclusion of hearings on the nation's economic pulse the committee reported: "If public works are to be accelerated and 'shelf' programs activated at times when private employment is falling off, it is imperative that an office of co-ordinator of public works planning, as proposed by this committee last year, and now proposed by the President, be put into operation as soon as possible. We commend this legislation to the appropriate committees in the House of Congress."

The committee noted that depression blues and wartime shortages have caused the nation to fall behind in meeting public works needs. It also stated that, "Construction of schools, highways, hospitals and other community facilities, including, as the President has recommended, slum clearance and public housing must move forward more rapidly during the immediate years ahead. Insofar as the Federal Government finances these public works, and we believe it should make important financial contributions, the financing should come direct from the Treasury, rather than from indirect authorities which circumvent the public debt limit or are nurtured by special earmarked revenues."

Public Works Construction Plan Survey Completed—The year-long U. S. Government survey of state-local public works projects has been completed. Some 4,000 local governments, including all 48 states, have reported on their plans for future public works projects. The survey shows the existence of plans for 71,639 separate public works projects estimated to cost $27.7 billion. The figures reflect the status of plans as of October 1, 1954 and they exclude work slated to start before June 30, 1955 or state and local public works projects for which federal aid has been approved.

Here is a listing of the projects in the "ready to go," "planned" and "programmed" categories: 1. *Ready-to go*: 5,620 projects with an estimated construction cost of $1.8 billion and a land cost of $169 million. 2. *Planned*: 17,215 projects with an estimated construction cost of $5.75 billion and a land cost of $431 million. 3. *Programmed*: 48,-804 projects with an estimated construction cost of $17.7 billion and a land cost of $1.76 billion.

In the "planned" projects category, one-half of the local governments having such projects indicated that they lacked funds to complete preparation of plans and about one-fourth lacked authority for plan completion. In the "programmed" category, almost 80 percent of the governments reporting such projects indicated that they lacked funds to complete their plans while nearly one-half need additional authority. The 4,068 local governments which were convassed accounted for about 85 percent of all local government expenditures for public works programs in fiscal 1953.

Of the planned projects, 30,851 are for highways, with an estimated cost of $9,174 million, plus a land cost of $1,595 million; 8,604 are for sewerage facilities, with an estimated cost of $2,411 million, plus a land cost of $18 million; and 4,825 are for water supply, with an estimated cost of $1,918 million, plus a land cost of $139 million.

The survey was conducted by the Bureau of the Census, U. S. Department of Commerce. It was made in conjunction with the Housing and Home Finance Agency and the

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The Palmer Filter Bed Agitator is covered by U. S. Patents 2309166 and 2309017.

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CONSTRUCTION—The Palmer Filter Bed Agitator is constructed of brass and bronze throughout. Nozzles can be removed easily from the agitator arm.

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WATER REQUIRED—The Palmer Agitator operates with low volume at high velocity. Usually, a delivery of ½ g.p.m. per square foot of filter bed is ample.

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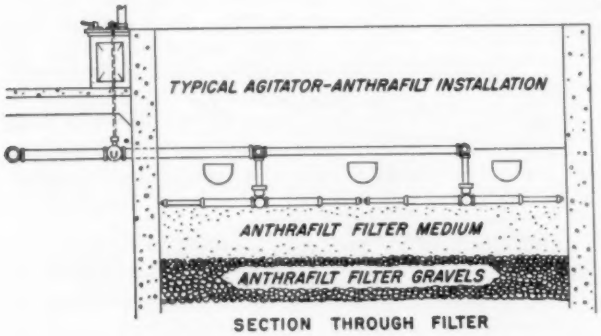

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AIRPLACO concrete gunning equipment tops all other methods for street, sidewalk and curb repair; restoration of ditches, culverts and retaining walls; storm sewer repairs and many, many other uses.

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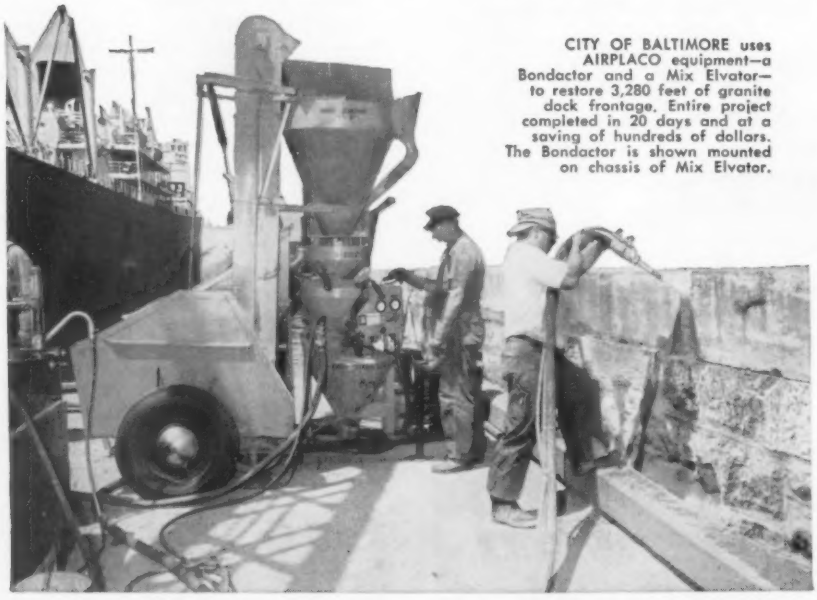

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The report shows that the 48 state governments accounted for about one-fourth of the number of projects reported and about 33 percent of the total dollar volume involved. Following is a breakdown, by reporting units;

1. *State governments*: 19,635 projects with an estimated cost of $9.1 billion and an acquisition cost for land of $1 billion.

2. *Municipalities & Townships*: 36,466 projects with an estimated cost of $11.3 billion and an acquisition cost for land of $1 billion.

3. *Counties*: 7,634 projects with an estimated cost of $2 billion and an acquisition cost for land of $104 million.

4. *Other Local Governments*: 7,-904 projects with an estimated cost of $2.8 billion and an acquisition cost for land of $145 million.

Water and Sewage Inadequacies—An exhaustive study, recently conducted by the Commerce Department's Water and Sewage Industry and Utilities Division, with the aid of the Census Bureau, the Public Health Service, Geological Survey, and Commerce Department field offices, reveals that it will cost an estimated $25 billion to provide adequate water supply and sewage disposal facilities to serve the nation's needs during the next 10 years. This represents a 60 percent increase over the 1954 value of present facilities which has been estimated at $42 billion — $23 billion in water supply facilities and $19 billion in sewage disposal facilities.

This new study covered 552 water supply systems. Each of these serve populations of 25,000 or more, which means that the survey covered about 75 percent of the 106,000,000 persons served by public water supplies in the United States at the end of 1953. A detailed analysis was made to determine needed construction to provide complete adequacy of facilities. Projections were made to estimate the rate of future growth. Estimates were also made of the annual construction needed to offset obsolescense and depreciation.

Water systems were considered adequate if they had an overload capacity exceeding a maximum day's use by 20 percent or more. Only 58 percent of the systems studied met this standard of adequacy. Systems considered adequate have reserves above the maximum day demand, averaging 47 percent; 21 percent of

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Tournatractor *speeds* garbage disposal *for city of 175,000*

Public Works Department of Nashville, Tennessee, originally bought their Tournatractor for handling scattered odd jobs around the city. A year or so ago, the city tried this rubber-tired tractor on a sanitary landfill dump. Experiment worked so well, this operation has become Tournatractor's primary year-around job . . . though it still is available for speeding scattered maintenance assignments anywhere in Nashville.

Spreads, compacts, covers refuse

In typical operation on the dump, Tournatractor dozes truck-hauled refuse down a 10% grade to fill a ravine. Then, Tournatractor travels back and forth over the fill, compacting the trash with its big rubber tires. After material has been sufficiently compacted, cover dirt, hauled from distant cuts by truck, is spread and leveled by the versatile tractor. Its tires roll over both rubbish and dirt . . . flex continuously for self-cleaning. When crawler-tractors have been used on Nashville's dumps, tracks had to be modified to fit refuse handling, and frequent cleaning of clogged treads was necessary.

Big rubber tires give Tournatractor good traction in spite of rolling resistance of 50 to 130 lbs. 18-ply tires roll safely over glass, tin cans, and other sharp objects.

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Adds Operator G. G. Mullins, "Tournatractor does this sort of work faster than crawlers. I'm not as tired after riding the Tournatractor as I am after riding over the steel plates of a crawler."

Drives over city streets

Despite a busy schedule at the dump, Tournatractor has some spare time during each 48-hour week. Its high speed on rubber enables it to drive out to clear playgrounds, alleys, and do other odd-lot grading jobs. Occasionally, it drives a mile or two across town to pull out city trucks which have bogged down in unimproved alleys. All job-to-job travel is made under its own power. Big, low-pressure tires do no damage to city streets, sidewalks, or curbing.

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the systems studied have reserves of only 11 percent over the maximum day demand, while another 21 percent—serving a population of about 26,000,000—have overload capacity exceeding the maximum day demand by less than 5 percent. Communities in this latter group are obviously the ones which are most likely to experience water shortages.

A similar procedure was followed to determine the existing inadequacies of major sewage treatment facilities throughout the nation. Statistics obtained from a careful study of these major systems was then expanded to develop the total estimated needs for the nation.

Utility Relocation Cost—One of the provisions included in the Federal-Aid Highway Act of 1954 called for the Secretary of Commerce to conduct a study of the problems posed by the necessary relocation and reconstruction of public utilities resulting from highway improvements. The responsibility for undertaking this study was delegated to the Bureau of Public Roads. Representatives of public utilities and public service organizations, including the APWA, were asked to assist the Bureau in developing suitable forms to collect basic information on the costs, character and extent of utility changes that were made because of highway construction projects.

The BPR report, recently released, summarizes the cost data which it received from state highway departments and utilities — both publicly and privately owned. The study indicates that the cost of relocating utilities exceeded 2.6 percent of the $1.7 billion cost of highway construction on the federal-aid system in 1953.

Utilities were re-imbursed for about 25 percent of the total relocation costs incurred. Half of this however, was returned for relocations involving expressway projects in California, Connecticut, and New Jersey.

The Joint Committee on Atomic Energy has appointed an eight-man panel to study the impact of peaceful uses of atomic energy. "The general purpose is to speed this Nation's development of the peaceful use of the atom," said Senator Clinton P. Anderson (D-NM), chairman of the committee. Samuel B. Morris, general manager of the Los Angeles water and power department is one of the eight appointees. He is expected to bring municipal atom-power needs to the attention of the study group.

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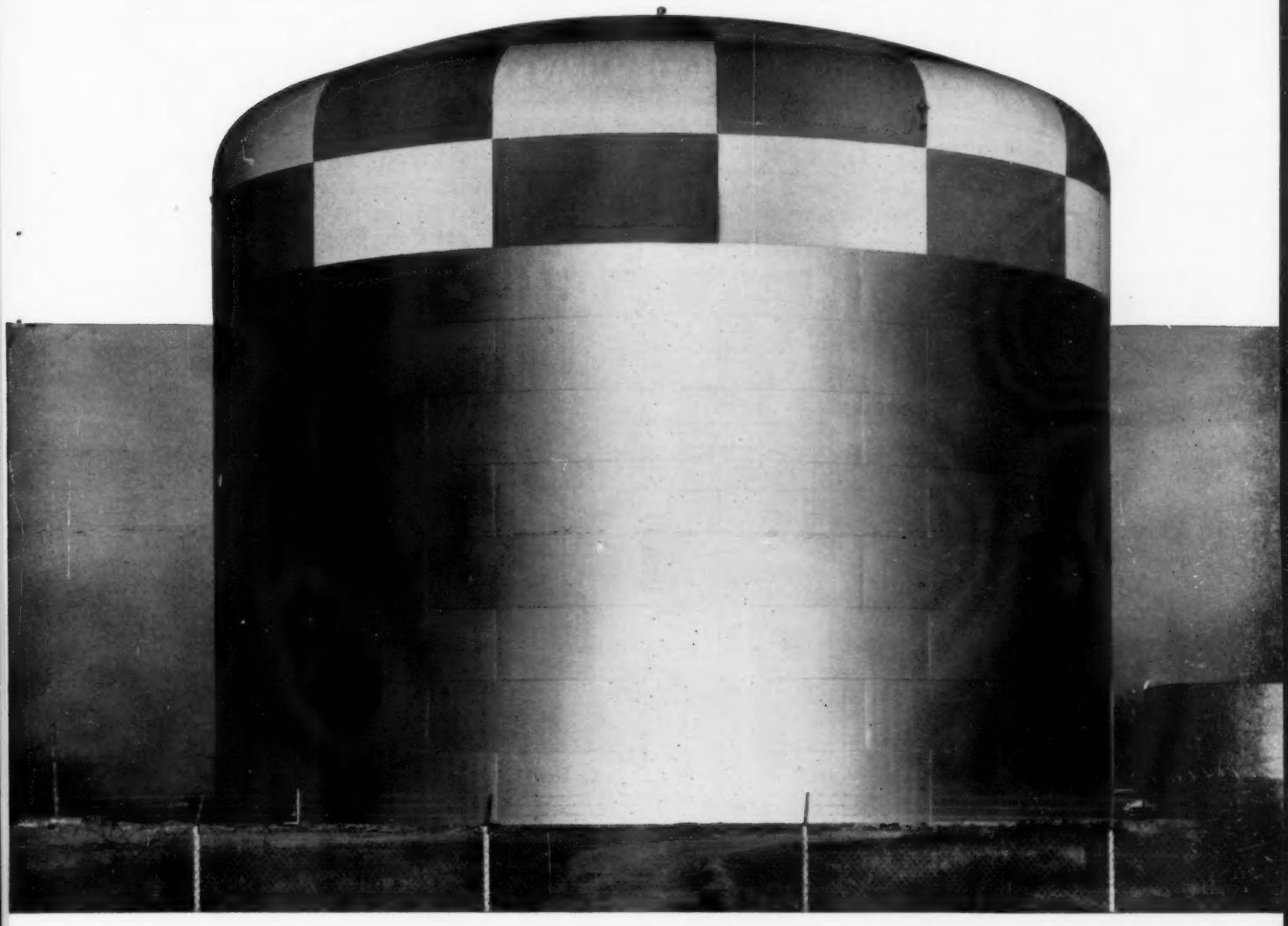

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Charges for Water and Sewer Services in Colorado

SUPPLYING WATER and sewer services in any municipality is a distinct problem in itself. So many special considerations are involved that a uniform system for cities between 1,000 and 3,000 population, for example, would be both impossible to formulate and useless to any specific situation. There is no standard answer to such questions as what shall we charge, how shall we pay for our system, or should we use meters? These variations in conditions are found especially in Colorado where there are great differences in the availability of water to cities throughout the state. Where some cities can drill a well and acquire an adequate amount of water, other municipalities must pipe their water considerable distances. On the other hand, a limited supply of water will usually cause higher rates despite the cost of operations. These considerations should be kept in mind throughout this study which was made by the Colorado Municipal League. J. T. Bell is Executive Director of the League. Data were compiled by Donald L. Pollard of the League Staff. The report here is in a condensed form. The full report is available from the League for $3.

Water and Sewer System Financing

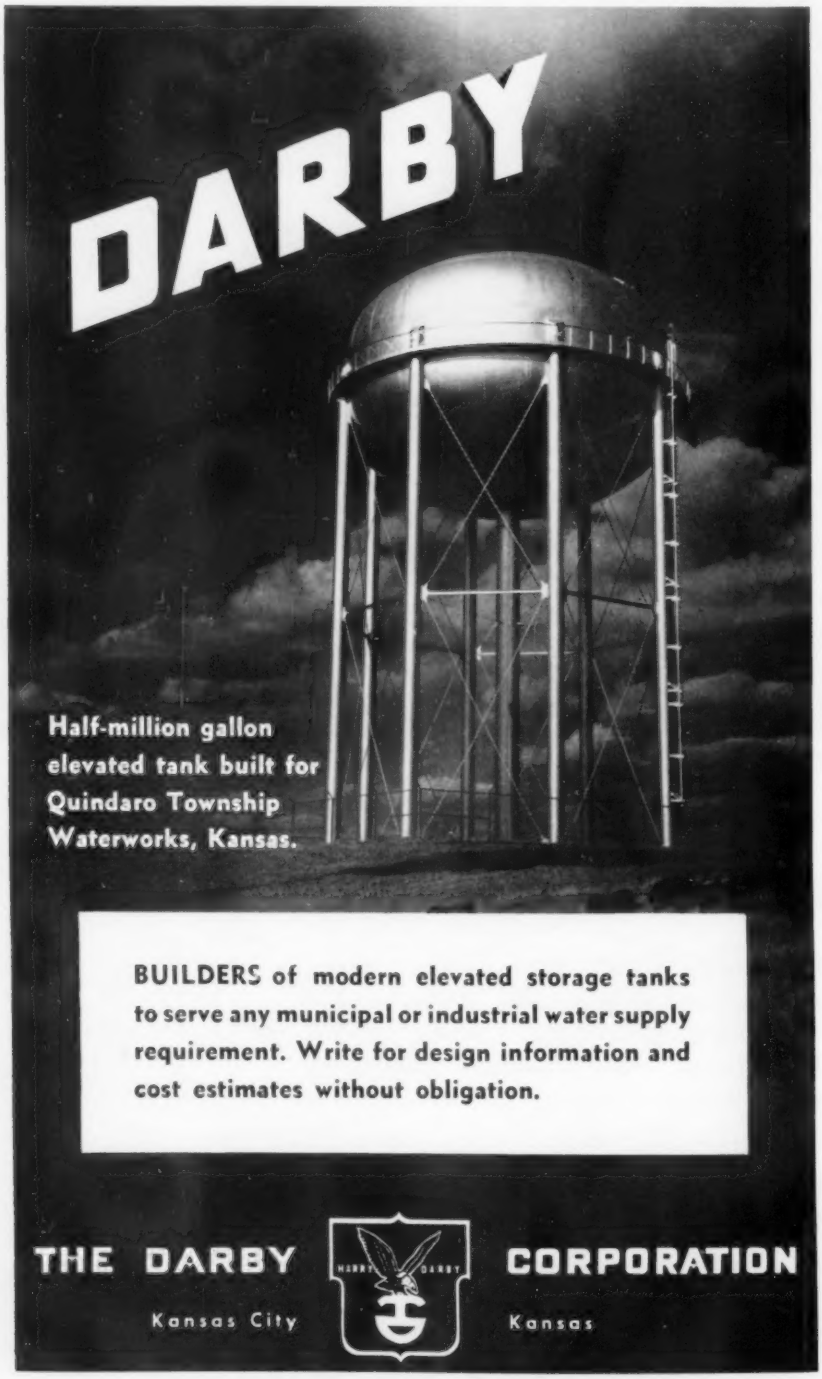
The two major features of water and sewer financing seem to be that water systems are usually financed wholly or in part by general obligation bonds, while sewer systems are handled through an increasing number of special or general improvement districts. The role of the revenue bond is somewhat peculiar, even though it is the second most frequently used method of finance. The revenue bond is usually found in conjunction with the general obligation bonds. This combination of general obligation and revenue bonds as a means of paying for municipal water systems is most typical for cities above 2,000 population. Below this population the general obligation bond is used more frequently.

Sewer systems are financed in a majority of cases through the general obligation bond. There is an increasing number of special districts being created to handle the mechanics of sewer financing. Cities faced with what might be called "growing pains" use special districts to finance additions to their present systems. This is done primarily through issuing general improvement bonds. These are in the nature of a general obligation bond. Prior to the 1930's special assessments were made in many cases to pay for new improvements. However, with the great amount of defaulting of special assessment bonds brought on by the depression, the method has been abandoned in favor of the general improvement bond.

Meter and Installation Costs

When considering the means by which municipalities finance their water and sewer systems, there is the problem of what costs shall be carried by the city and what costs shall be assessed to the consumer. There are four such costs: meters, trunk water mains, house water mains, and sewer mains.

Meter costs are paid for by the consumer in 47 percent of the cities, and by the municipality in 53 percent. The practice is not uniform;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in the larger cities—over 10,000—the consumer pays in 8 of 10 cases. At the other end of the scale— under 500 population—the consumer pays in only 4 out of 12 communities.

Installation Costs — In almost every case, trunk lines are paid for by the city through bond issues. Where variations occur, the property owner is usually found to share the cost with the municipality. One other case of the property owner paying for the trunk line is found in new subdivisions, where the cost for the system has been divided up and added to the price of the houses. On the other hand, the property owner almost always pays for the line extended from the trunk main to his house. Various arrangements have been found as to how far the city will extend its trunk line. In some cases the connection is made at the property line; in others, at the curb, sidewalk or center of the street. This variation in distance from the main causes considerable difference in the connection charges.

Sewer Installation—In the case of sewer lines, the sharing of costs between the municipality and the property owner is less usual. In most cases, in fact, the property owner pays for the sewer. There are, though, frequent cases similar to those cited in relation to water mains.

Water Charges for Connections, Stand-bys, and Temporary Residents

After a water system is installed there remains the problem of assessing various operating costs. Such charges may be defined as connection charges, stand - by charges, and/or charges for temporary residents.

Connection Charges—A connection charge is usually a flat rate based upon the size of the pipe to be connected, e. g. ¾", ⅝", ½", or 1" etc. Such a charge usually is over and above the actual costs involved. In some cases the charge listed will add "plus costs." For an overall picture, the average connection charge is somewhat above $32.00 with a range of $1.00 to $310.00. Much of this difference can often be explained in part by the length of the house line.

Stand-By Charges—With few exceptions, stand-by charges are not made in cities below 1,500 population. In all, only 10 percent of the cities questioned have such a charge. Those who do include Denver and surrounding communities.

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by C. Mervin Palmer, Aquatic Biologist, and Clarence M. Tarzwell, Scientist Director,
Robert A. Taft Sanitary Engineering Center
Public Health Service, Cincinnati, Ohio

6 Full Pages of 4-Color Illustrations
By Harold J. Walter

This major article appearing in this issue of PUBLIC WORKS, prepared in close collaboration with U. S. Public Health service authorities, includes for the first time in magazine history, full and accurate color plates for the identification of types of algae most important in water supplies—those which cause tastes and odors, clog filters or are likely to be found in clean or polluted waters. Color plates of this quality have never before been available to simplify the job of algae identification.

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Temporary Resident Charges—The question concerning temporary residents' charges was aimed primarily at summer residents. Such charges may be made in any one (or all) of three ways: by a turn-on, turn-off, or minimum charge. Turn-on charges tend to be assessed more frequently in the higher population groups. However, of all the cities the ratio is about 3:1 in favor of not making a turn-on charge. Of those who make a turn-on charge, over 30 percent also have a turn-off charge. Eighty percent of Colorado cities do not charge a turn-off fee, but the turn-off charge is frequently included in the turn-on charge. For that reason, the percentage of cities without turn-off charges may be high. Where both a turn-on and turn-off charge is made, the charges are almost always the same—$1.00.

An Analysis of Water Rates

The minimum charge, like the stand-by charge, is made in larger cities. This minimum charge to temporary residents is frequently the same as the monthly minimum for regular water users.

This section is intended to show how municipalities in Colorado sell their water. It gives a breakdown of which cities use meters and to what extent; it shows the billing period and how much water is supplied at a minimum cost. The flat rates of metered cities have been listed together in this section; in later sections they are separated.

Metering—The tabulation shows that about half the cities questioned use meters. This is not a fair picture, though. Actually only 25 percent of the cities use the meters for all consumers. Furthermore, only about 40 percent of the cities meter over 5 percent of their water users.

The commercial users' figures show another way of analyzing metering figures. About 78 percent of all cities questioned meter their commercial users. By dividing the group at 500 population, it is clearly noted that in almost all larger cities commercial users are metered.

Billing Periods—Almost unanimously, cities use either a monthly or quarterly billing period, or a combination of both. If there is a combination, one of the following two situations exists: metered rates are charged monthly and flat rates quarterly, or commercial bills are charged monthly and residents quarterly. In actuality, the commercial users are generally metered.

In a tabulation of cities which use the monthly billing period only, and those who use a quarterly billing period only, the following is the result: 62 percent use the monthly billing period and 38 percent use quarterly billing. However, 15 percent of the communities questioned used both a monthly and quarterly billing period. Considering all methods, the monthly billing period was favored with 53 percent of the cities using it. Seasonal costs such as irrigation and lawn sprinkling water are charged annually in most cases.

Units of Sale—The usual argument of what units shall be used to measure water is between gallons and cubic feet. In Colorado, however, another means of charging for water is the flat rate. The most common units of measure are the gallon and the flat rate basis. (Flat rate is actually not a unit such as the gallon, but for simplifications it is called that.) Front foot is used primarily for irrigation water. The frequency of use for each is determined by the method of selling water. That is, a flat rate of measure and flat rate sale of water are used together, and where water is sold through meters, gallons are used in over 90 percent of the cases.

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The number of taps as a unit of measure is also used in flat rate sales.

Minimum Amounts—There seems to be two purposes for a minimum bill: First, to provide enough water to insure reasonable sanitation, and second, to cut down on wasteful practices. The minimum rate is found primarily where there are metered rates. However, minimum bills are also found in some situations where flat rates are used. No average figure can be given for the minimums listed since they are minimums for both quarterly and monthly billing periods.

Sewer Rates

Much that has been written previously on water rates will apply here. Most sewer charges in some way are made in conjunction with water bills. They often are added to the bill or attached to it.

In 58 percent of the reporting cities sewer rates are based on a flat rate. In 39 percent the sewer bill is based on the water bill. In the latter cases, the water and sewer bills are combined. Only 5 percent of the cities use meters for charging sewer bills.

Of the cities who answered the question of whether the sewer bill was added to the water bill, 42 percent did not add the two together. Some who answered this way qualified their answer by saying the sewer charge was added separately. For this reason the practice of adding the sewer and water charge together on the same bill is probably much more frequent.

Few cities below 17,000 charge a sewer rate based on a percentage of the water bill. The percentage charged varies considerably, from 13 percent to 80 percent. For these figures to be meaningful, the water rates must be considered.

Most municipalities have a connection charge. The range of these charges is wide, starting at $1.00 and going as high as $150.00 The average cost tends to increase as the size of the city decreases and may or may not include the material costs. The higher fees most usually do. Connection charges usually vary with the size of pipe used. For this reason commercial connection charges are higher. Where some cities have no connection charges, the costs of materials are assessed. The average is near $30.

The extension of water and sewer services beyond a municipality's limits can be handled in many ways. Three problems are common, though, in all situations. They are: Who pays for the extension; Will the city have control of the service outside the city limits; and Should the rates be the same to customers both in and outside the city limits?

Extended Water and Sewer Services

A majority of cities extend water services (76 percent); however, a majority do not extend sewer services (61 percent). This wide difference can be partly explained by the fact that all municipalities questioned in this survey had water systems, whereas they did not always have sewer systems. Yet even for cities with sewer systems, a large number did not extend the service unless the special district extended beyond the city limits.

Where cities extend their sewer and water services, they also extend their jurisdiction. When this extension goes beyond the corporate limits a problem arises. Seventy-five percent of cities who extend water services retain control over their lines outside the city limits. Cities from 1,500 to 3,000 have retained control over their extended

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water services more than have higher and lower population groupings.

Since many municipalities have special sewer districts providing service beyond the city limits, these districts have been considered part of the municipality. Where a special district retains control the answer is listed as if the municipality had control. It is interesting to note that almost always a special district will retain control. This may be one reason for sewer systems being subject to such a large percentage of outside control.

In order to cover costs involved in extending a service beyond city limits, higher rates are charged. This, however, does not always follow, especially in instances of only a few long-time customers.

Extra charges to outside users can be made in many ways. The most common is to charge a rate 1½ times or double the rate of customers inside the limits. Another method used quite often is an increased connection charge. The following generalization can be made about the two most frequently used rates—the 1½ times increased rate and the double rate: in extended water rates the 1½ times increase is used more frequently than the doubled rate; for extended sewer rates, the double rate is found to be the more frequent of the two.

Two other practices are found in increased rates for outside users. First, a charge is sometimes made to outside users that is not made within the city limits (stand-by charges). Second, meters are installed for outside users whereas flat rates may prevail in the city. Where meters exist in both areas, the common practice is to raise the rates per thousand gallons to outside users. One variation of this is to keep the rates the same but to provide more water for the same price to the customers inside the city limits.

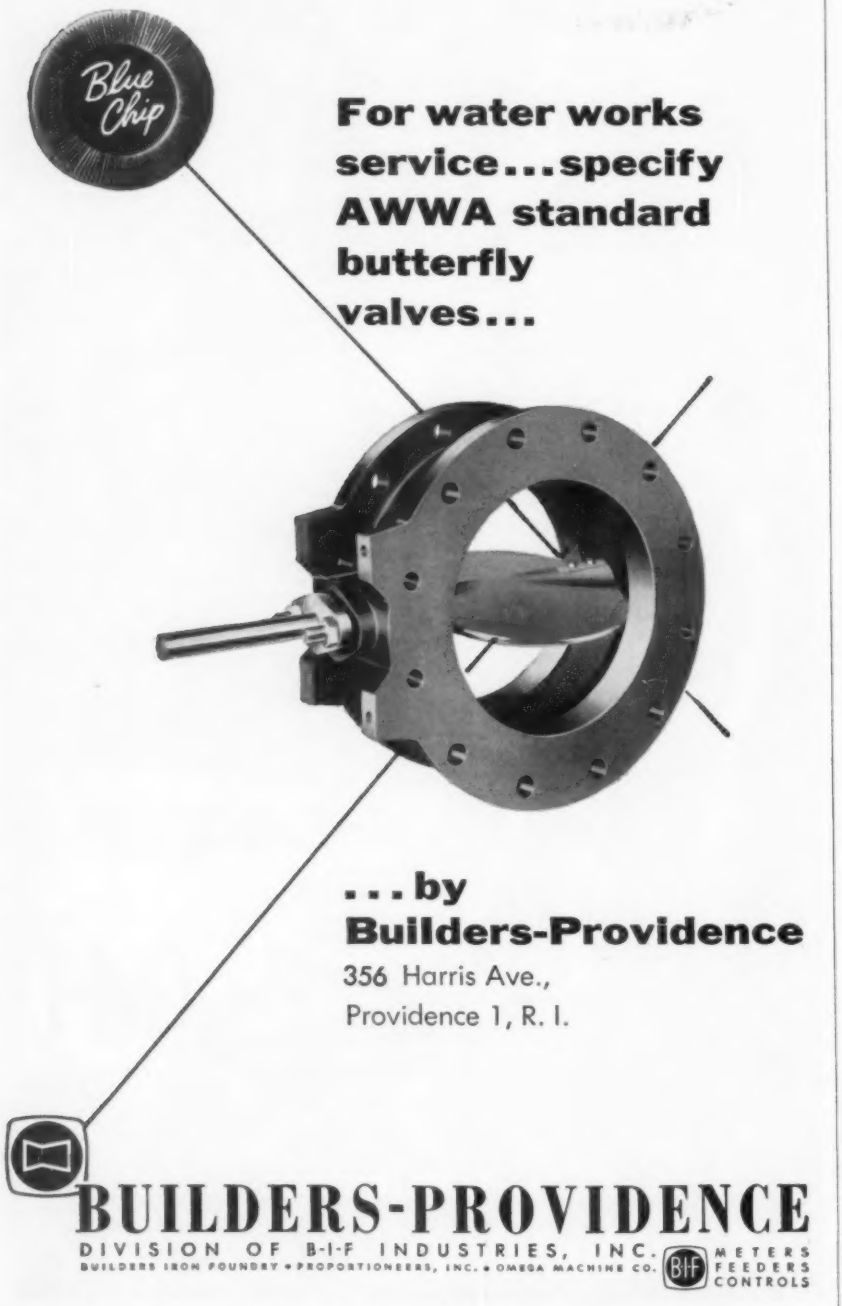
Typical Water Rates

The following section has three parts. The first two deal with residential water rates and the third deals with commercial water rates. Since so many municipalities in Colorado charge flat rates, an analysis of flat rates and metered rates for residences is possible.

Two major assumptions had to be made in the tabulations. Since a great majority of communities used a ⅝-inch tap, this unit may be assumed in all cases except where specifically noted. Monthly rates are used for all figures. Quarterly rates were divided by three to arrive at a monthly basis. Since fewer tabulations were made about commercial water rates, the metered and flat rates appear in the same tabulation.

Metered Residence Rates:—Minimum—The average minimum rate is $1.85 per month which provides an average 3,297 gallons. Next Rate—Metered water rates usually are lower for larger volumes used. These decreased costs differ from place to place. The "next rate" is a listing of the second step of the water rates. The first step is the minimum rate. In many cases only the two steps are involved. In other situations as many as five or six decreasing rates are used.

Flat Rates For Residences—In dealing with flat rates, gallon units cannot be used in a comparison. It would also be impossible to list all flat rates, since in many cities the listing is quite lengthy. For this reason, a typical residential situation was assumed and the flat rates were computed to fit it. The only exception for this situation being typical would be the five-room house. Flat rates for homes are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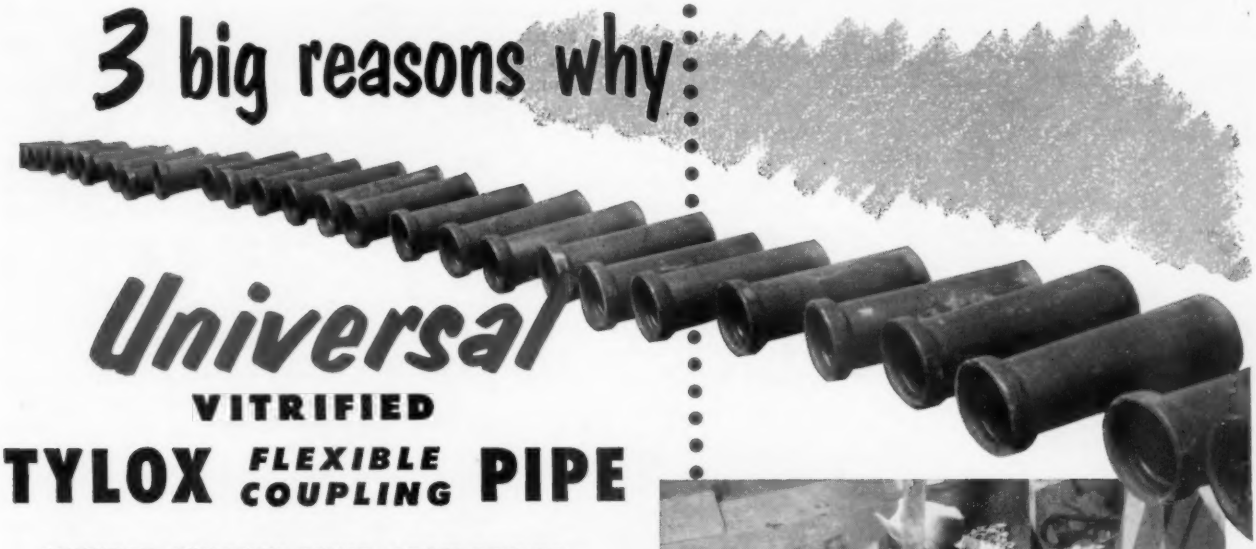

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ENGINEER: E. J. Barstow & Associates, Akron, Ohio

CONTRACTOR: Ranallo Construction Company, Akron, Ohio

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charged for so many rooms plus so much for additional rooms. The first rate usually stops with four rooms. By assuming a five-room house, the rate includes the cost of one additional room.

The average cost for 5 rooms ranges from $1.17 in cities over 10,000 to $1.71 for the next group (3,000-10,000); $1.47 for 1,000-3,000; $2.28 for 500 to 1,000; and $2.15 under 500. Average costs for a 50-ft. lawn ranges from $1.49 in the larger cities to 67 cents in the smallest group. The average monthly bill varies between $2.95 and $2.29.

Commercial Rates—A third tabulation deals with a comparison of metered and flat rates for commercial water users. An approximate monthly average for commercial water users is 50,000 gals. The average commercial metered cost of 50,000 gallons of water is $11.32.

Not all commercial customers use the same amount of water. Their relative standing can be seen in the flat rates. For six typical businesses, average flat rates are as follows: Filling stations $3.16; garages $3.20; hotels $3.47; restaurants $3.20; schools $4.90; and theatres $3.30. Frequently, especially in the case of schools, different rates are given for old and new consumers.

Many cities do not charge metered rates but do provide for them in their ordinances. In such cases this rate is also listed with the metered rate of 50,000 gallons even though all rates are charged on a flat rate basis.

• • •

Results of Fluoridation in Sheboygan

A survey of tooth decay among kindergarten children conducted by the commissioner of public health of Sheboygan, Wisc., found that after nine years of water fluoridation in Sheboygan, 57.6 percent of the 549 senior kindergarten pupils had no cavities, whereas 10 years ago it was 20.4 percent of the students. A survey of the fourth grade children showed 46.5 percent improvement and a 40.7 percent improvement was found in older children.

Sheboygan's water fluoridation was started nine years ago after a comparative survey of caries in school children in Green Bay where the natural fluorine content of the city's deep well is more than 2 ppm. The Green Bay survey, according to the state board of health, showed that 30 out of 100 children in Green Bay never had a cavity. Sheboygan adds one ppm of sodium fluoride. No trace of discoloration or mottling of the teeth and no toxic conditions have been found during the nine years of the Sheboygan experiment.—Wisconsin Municipality.

• • •

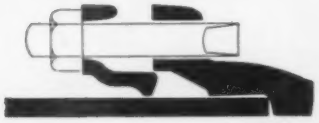
Referencing Auxiliary Stripe for Nonpassing Zones

B. E. DAVIS,
Associate Resident Engineer, Texas Highway Dept.

In Texas Highways in the summer of 1953 this residency started referencing the beginning and end of the auxiliary no-passing stripe. The referencing is accomplished in the following steps: (1) Locate the beginning and end of the no-passing zone; (2) paint an arrow on a tin shingle; (3) hang the shingle on the fence opposite the beginning or end of the zone and on the same side of center line as the zone, with the arrow pointing in direction of zone.

The advantage of this method of referencing is that once the zones have been established, they may be relocated by one person instead of a field party.

MAKE JOINTS



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Mechanical Joint has rapidly become the leading type joint for cast iron pipe for water or gas. A McWane-Pacific Boltite mechanical joint pipe line can be laid fast by untrained workmen, using only a ratchet wrench to make the joints. No lead pot, no calking tools.

The Mechanical joint is designed on the stuffing box principle—a thick rubber-compound gasket, triangular in cross section, being compressed by a bolted gland or follower ring. The joint is bottle tight, but flexible to allow settlement, expansion or contraction of the pipe line. Mechanical joints are interchangeable with fittings, valves, hydrants and pipe made by all leading manufacturers.

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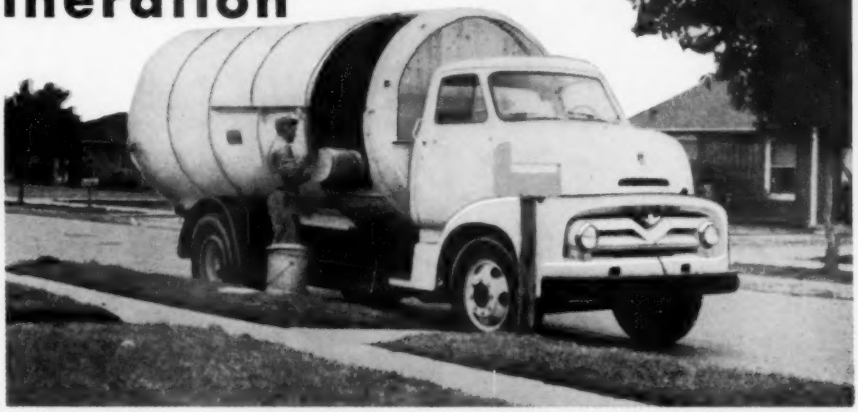

Pak-Mor gives you precompaction . . . less bulldozer handling time at landfill. Dumped load quickly handled and worked because 50,000 lb. force of packer plate precompacts refuse in Pak-Mor body. In incinerator operation . . . Precompaction breaks up bulky refuse, makes handling simple. Pak-Mor means more and bigger loads at landfill or incinerator in less time.

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- Lighter chassis means quicker in and out at sanitary landfills . . . Less bogging down!
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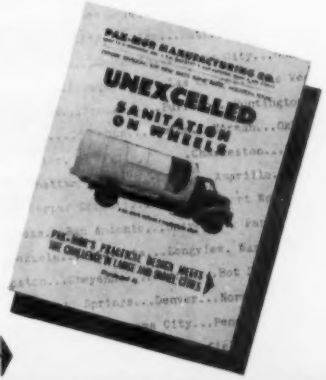

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Water Main Repair Unit

Ens. W. G. Turney, Assistant Public Works Officer at the United States Naval Station, Bermuda, reports that the Seabees stationed there have come up with a handy device, a water main repair unit to tend the many broken water lines on the Island. The Naval Station in Bermuda was constructed mainly on coral fill which during the past few years has settled unevenly causing a great number of broken water lines.

To facilitate the repairing of these many breaks, Chief B. S. Allen and the Seabees from the plumbing shop developed an idea originated by R. N. Endicott, UT2. The result was a trailer unit which consists of: (1) A small centrifugal pump for pumping accumulated leak water from the excavation pit. (2) An electrical generator to power the flood lights necessary in night work. (3) A propane furnace to melt the lead for pipe joints. (4) A compressor to run a small pneumatic caulking hammer. (5) A tool box in which yarning line is stored along with all the other special tools needed to repair a broken water line.

The construction of such a mobile unit at other installations may or may not be justified, depending upon the necessity for it, but at Bermuda, where broken water lines are a continuing problem and one of some magnitude, much time and labor has been saved by its use. One improvement that might be made on the unit is the substitution of a standard kerosene lead-melting pot for a propane burner and cylinder.—CEC Bulletin.

• • •

Offstreet Parking

(*Continued from page* 149)

already-jammed streets. The accommodations included a close-in municipal parking lot to accommodate 364 vehicles. All-day parkers prefer this lot to the metered lot several minutes from the business district.

The revenue obtained from the ten-cent Parkit-Lockit meters for curb parking as well as from other Kar-park meters in the area average approximately twenty seven cents per space per day. On the municipal lot Parkit-Lockit meters average twenty-two cents per day per space; those on the adjacent street thirty-four cents per day.

AKRON—Field studies by Ramp Buildings Corporation, consultants for Akron, revealed that a total of 71,528 vehicles enter the business district on an average day. Of these vehicles 27,296 passenger cars desire to park in the central district. There are 10,363 parking spaces of all types now available in the heart of the city accommodating 22,432 parkers leaving an average of 4,864 parkers unable to find satisfactory parking space.

The immediate program, estimated to cost $2,737,000 for property acquisition and facility development, will produce gross annual earnings of $356,846 and provide an operating profit of $181,284. This operating income is sufficient to amortize a 30-year 3½ percent revenue bond but will probably not provide sufficient debt coverage to be attractive to investment banking concerns. The consultants recommend that the city make an annual pledge of $56,972 to be made from curb parking meter revenue in order to provide a 1.60 debt service charge.

The immediate program recommended includes one parking lot and two parking garages to provide 1,295 parking stalls. Under a long range recommendation the consultants feel that six additional parking facilities are needed.

The sites and program recom-

Plan with Quality...

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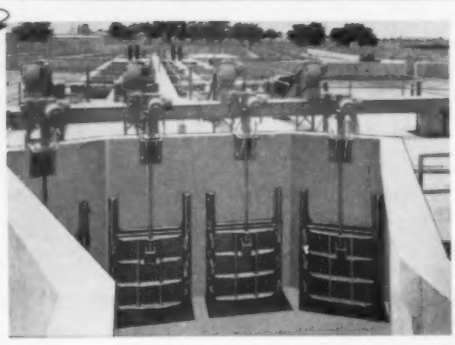

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BUT THIS!

Take a tip from the man at the right—he's laying out tube the reel way!

He's not bothering with awkward, loose coils; instead he's using the Wolverine *round* carton to reel out the tube. He's laying the tube in a straight line—avoiding tangles, kinks and bends—and he's taking full advantage of every inch of tube.

Yes, take a tip from him—do it the reel-way yourself. At the same time, take advantage of all the other conveniences of the new Wolverine round carton. Roll it, for example; or if you want to carry it, slip your arm through the convenient center hole. The carton has a gummed, color-coded identifying tape around the outer edge. A tug on it permits zip-quick opening without tearing the carton.

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In addition to copper water tube Wolverine also manufactures copper refrigeration tube, automotive tube, drainage tube and S.P.S. pipe.

Most important of all, use the top-quality, dependable Wolverine copper water or refrigeration tube *on all jobs*. It will pay BIG dividends. Insist on Wolverine the next time you order tube from your wholesaler. WOLVERINE TUBE, 1427 Central Avenue, Detroit 9, Michigan.

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mended by the consultants are still under consideration by the city. No definite decision has been reached. Private interests in the city have already completed one off-street parking garage and have three more planned.

• • •

Doc Symons

(*Continued from page* 90)

nents of mass fluoridation through introduction of fluorides into water supplies.

Tom also expressed some doubt that "artificially added" fluorides have the same effect as natural fluorides.

With that last comment I had to disagree. It's been a long time since I held a test tube in my hands, but I've always been under the impression that neither a chemist, nor a chemist's bones, teeth or other cells could tell whether a fluoride ion—or any other ion, was leached from soil through which the water passed or was added by human hand; and Nesin's comments about tea and vegetables seem to indicate that to be true.—But then this is probably a secondary point if fluoride is a villain.

★ ★ ★

Morris Cohn, former City Manager of Schenectady, who had advocated fluoridation in that city said he hoped Nesin's report would be available soon, that if Nesin's information is correct there will be need for some serious reconsideration of the whole matter. Mr. Cohn expressed some concern over the fact that the topic had been introduced unannounced, and that there were no representatives of either the state health department, the USPHS or the medical or dental professions present to defend or argue for their philosophies, attitudes and beliefs in this matter. —With that observation, there were many who agreed—but the corridors were buzzing after the session and it looks as though the controversy over fluoridation is a long way from dead—!!

★ ★ ★

News Notes from Brushy Bend

. . . April 15, The Annual Planked Shad Dinner of the South Jersey Assoc. of Water Supts. at the Salem, N. J. Country Club.

. . . April 25—Long Island Water Conference, at Centerport, L. L.

. . . April 27—North West Ohio Section AWWA at Sylvania, Ohio.

V.T.Y.—Doc Symons

Dodson's Digest

How to keep down dust in hot summer weather

Went up north on my vacation this year, and stopped off at a motel on the way. I got to talking with the owner about the weather. They were having a dry spell, and he didn't like it.

"I sure wish it would rain," he said.

"That's a fine thing," I grinned. "Here I am on my vacation, and you want it to rain."

"This dry weather is rough on my business," he went on, getting serious. "It raises too much dust, and my customers don't like it. The dust gets inside the cabins, and all over their cars. If it doesn't rain pretty soon . . . "

"Hold on," I broke in. "You don't need rain. What you need is Calcium Chloride to keep that dust down."

He looked puzzled. "Calcium Chloride? What's that?"

"Calcium Chloride is what state highway departments use to keep their roads dust-free," I replied. "It can solve your dust problem, too."

"How can I use it?" he asked, getting interested. "And how much does it cost?"

"It's easy to use," I said. "All you have to do is apply Calcium Chloride uniformly to your driveways and other unpaved areas. You can do it with a small spreader, or even a shovel. And it's inexpensive, too. It only takes one pound to cover a square yard."

He agreed to try it, and I continued on my way the next morning.

When I stopped at the same motel on my way back, it had been raining for two days. I looked up the owner, and he still didn't seem happy.

"Didn't the Calcium Chloride work?" I asked.

"Oh, sure," he said. "It worked fine. But I sure wish it would stop raining. This rain is rough on my business. Nobody travels in this weather. If it doesn't stop raining pretty soon . . . "

—L. D. Dodson

P.S.—Get complete information on how to stop bothersome dust in our leaflet, "Wyandotte Calcium Chloride for Dust-proofing." For your free copy, just drop me a line. *Wyandotte Chemicals Corp., Wyandotte, Mich. Offices in principal cities.*

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Over 35,000 feet of Clay Pipe, in diameters from 8 to 36 inches, will be installed over a 10-year period in Daytona Beach. Directing the project are City Manager LeRoy Harlow, City Engineer C. B. Moneypenny, Water and Sewer Superintendent Ralph Brennan, and Project Engineer C. E. Cannon of Metcalf & Eddy, Engineers.

Again . . . CLAY PIPE SOLVES A CORROSIVE SEWER GAS PROBLEM

CLAY PIPE FITTINGS are always available to handle every twist and turn in the line. This "Y" Fitting, for example, eliminates the need to improvise makeshift joints between feeder lines and mains.

Engineers faced a double problem on the $667,000 bond-financed sewerage project in Daytona Beach, Fla. The sewage has a high content of corrosive hydrogen sulphide, and the sandy soil has a high water table. Vitrified Clay Pipe with hot-poured joints solved both of these problems.

As experienced sanitary engineers know, *Clay Pipe is guaranteed for 50 years* . . . valuable "insurance" for any bond-financed project. When public health and the taxpayers' money are at stake, why take chances with substitute materials? Specify Vitrified Clay Pipe—and be *sure* the job will last.

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PUBLIC WORKS DIGESTS

The INDUSTRIAL WASTE Digest

Treating Press Board Wastes

A plant was built for treating wastes from the manufacture of 15 tons of press board daily, which contain inorganic pigments and fine fibers. The only aim being the removal of suspended matter, clarification alone was considered sufficient by the Connecticut State Water Commission. The plant consists of a square collection chamber provided with baffles to convert it to a flocculation and emergency diversion chamber; a mechanical clarifier with an overflow rate of 0.57 gal. per sq. ft. per min.; and a plunger pump for returning the clarifier underflow to a stock chest for use in manufacturing the darkest grade of product. This plant reduced the average total suspended solids from 215 ppm to 27 ppm; the settleable solids from 11.8 ppm to zero; the BOD from 70 ppm to 39; and the turbidity from 265 ppm to 63.

"Press Board Wastes Treated for Recovery and Reuse". By Harry W. Gehm, Nat'l. Foundation for Stream Improvement. *Wastes Engineering*, April.

Recovery and Disposal of Wastes

Most pollution problems can be reduced by housekeeping methods within the plant. Elimination or reduction of wastes at the source is another method. Evaporation of wastes to dryness and recovery of the residue are sometimes applicable. Solvent losses in chemical plants can produce a pollution problem. Recovery can be effected by adsorption on activated carbon, followed by steaming and collection for rectification. Oxidation ponds have found application for disposal of wastes from vegetable canning and processing. Cannery waste is also subject to disposal by "tree farming," spraying screened waste over woodlands through irrigation nozzles. Incineration of burnable residues is generally practical. A recent development in chemical treatment is cyanide waste treatment through oxidation of cyanides by chlorination.

Biological treatment, using trickling filters, biofilters, activated sludge or biosorption, may be utilized when sewage, sewage sludge or other sources of bacterial cultures are available for inoculation of the waste. Artificial feeding of nutrients is frequently the key to success in industrial waste treatment biologically. Anaerobic digestion is valuable in treatment of concentrated organic wastes.

Catalytic oxidation is applicable to fume problems, and indications are that the installation cost of catalytic oxidation processes is high in proportion to operation costs.

The Salvo process is used to oxidize organic matter in aqueous solution by the application of heat under pressure. This will probably work successfully with a number of wastes, but there are engineering problems in compressor design. Ion exchange, closely allied with activated carbon with much the same results as with adsorption, is used for treatment and recovery.

"Waste Treatment Methods—Recovery and Disposal." By H. L. Jacobs, E. I. du Pont de Nemours and Company. *Chemical Engineering*, April.

Removing Dust From Air Streams

One method of removing dust from air or gas streams, of significance in air pollution abatement and of great potential applicability, involves contact of the air with a liquid, usually water. Such devices, known as scrubbers, were evaluated to obtain comparative performance characteristics and to obtain information on the fundamental mechanisms which control their performance. Aerosols were prepared by feeding dust into a high velocity air or gas stream. Contacting devices studied included cyclones, pipe-line configurations, Venturi tubes, orifices, and sieve plates. Dust dispersal systems involved the use of talc, titanium dioxide, and ilmenite. The collection efficiency and pressure drop of the contacting devices were measured at varying air flow rates, water flow rates, and dust loadings. Ordinarily the pressure drop in the contactor was independent of the degree ot dust loading in the air stream. When compared at the same gas or air power consumption, all scrubbers gave substantially the same degree of collection, regardless of whether the pressure drop resulted from higher water flow rates or higher gas flow rates. The collection efficiency varied directly with the pressure drop. The method for introducing water into the device was found to be relatively unimportant. The injection of steam at 2 to 3 times that required for saturation resulted in increased dust collection efficiency. The predominant mechanism which results in deposition of dust on water drops in a scrubber is believed to be that of turbulent circulation of dust-laden gas over the water drops.

"Performance of Wet Dust Scrubbers." By C. E. Lapple and H. J. Kamack, E. I. du Pont de Nemours and Company. *Chemical Engineering Progress*, March.

Measuring and Recording H_2S

Hydrogen sulfide, always present in petroleum refining operations, causes concern because it is a deadly poison. In concentrations over 20 ppm. it is considered unsafe. Its obnoxious odor reveals it at low concentrations, but the human nose soon becomes insensitive to the odor. The safety-mindedness of the petroleum industry demands that such a hazard be continuously recognized. Hence, an instrument for measuring and recording hydrogen sulfide in air in the concentration range of 0 to 100 ppm has been developed for testing refinery atmospheres. It can be equipped to operate an alarm, either visual or audible, should the concentration exceed a predetermined limit within the

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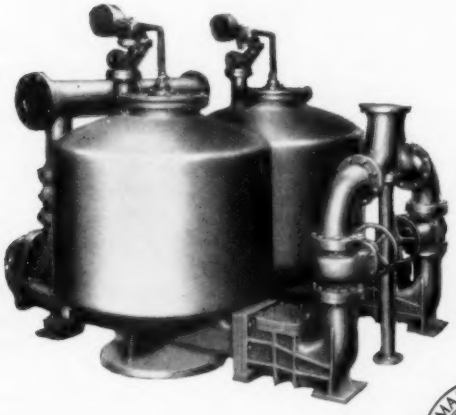
YEOMANS are headquarters for Pneumatic Ejector Pumps with a complete line of types and sizes for all low gallonage application.

YEOMANS' experience of more than fifty years in the manufacture, installation and maintenance of pneumatic ejectors has provided convincing proof that this type pump is not only best for low gallonages, but is completely sanitary, unexcelled in dependability and has lowest overall pumping cost.



TYPE SDV SHONE® PNEUMATIC EJECTORS are the mechanically controlled type and are recommended for most installations.

The Shone Ejector passes solids up to 4″ in the smallest ejector size and neither screens or shredders are required to prevent clogging. It has no internal parts to restrict flow; is simple in design, positive in action and performs indefinitely without wear, care or attention. Liquid waste is collected in a large pot containing an upper and lower bell. As the liquid level rises, first the lower then the upper bell is buoyed up to permit a counter balance to close the exhaust connection and admit compressed air. Air pressure closes the inlet check valve, opens the discharge check valve and the liquid enters the lift line under pressure. Maintenance is negligible. The simple parts are few and do not move far or fast. Frequent check-ups are not required. Capacities from 30 to 1.000 gallons; heads from 15 to 50 ft.

TYPE SEC SHONE PNEUMATIC EJECTORS are electrically controlled by two rigid stainless steel electrodes of unequal length suspended in the receiver. The rising liquid closes the circuit between them and energizes a relay which starts the air compressor. Compressor shuts off when liquid drops below the longest electrode. Otherwise the operation cycle is the same as in Type SDV Capacities from 30 to 600 gallons; heads from 15 to 50 ft.

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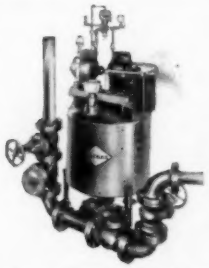

PACKEX PNEUMATIC EJECTOR is an economy packaged, low capacity pump designed especially for small buildings, small residential groups and similar smaller installations which must have dependable lift service. It is factory-assembled and is received complete ready for inlet and discharge connections; no additional electric work is required, nor does it necessitate a wet well. It will handle solids up to 2½ inches in volumes up to 20 g.p.m. and is completely sanitary with a hermetically sealed pot.

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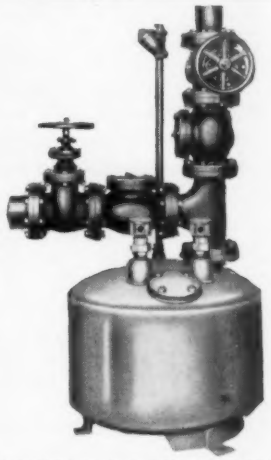
EXPELSOR PNEUMATIC EJECTOR is applicable for all small-volume waste removal. It is effective in operation, economical to operate and low in first cost. Consisting of a hermetically sealed receiver, the Expelsor is equipped with two rigid metal electrodes suspended in the receiver as in the Type SEC Shone Ejector and operates in the same manner to push the liquid waste up and out through the discharge line. Solids up to the size of inlet and discharge connections pass through easily. It does not require a wet well.

The Expelsor can be operated by plant air or steam, or by air from a Yeomans Air Compressor and is therefore adaptable to many different conditions. Capacities from 30 to 100 g.p.m. and larger; heads from 10 35 ft.



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When in the market for a pump, you want and welcome the counsel of a man who not merely knows pumps but is trained to *understand the problem you expect the pump to solve.*

You'll find your local Yeomans representative just the man you're looking for. He operates, or is a member of, his own business. He handles several excellent lines of equipment in the same market category as Yeomans Pumps. As a rule, he has an engineering degree—in some instances he's a capable "engineer by osmosis." In any case, he's a good business man, fully qualified to analyze a problem and to recommend a practical solution.

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range of the instrument. This analyzer-recorder is based upon the reaction of hydrogen sulfide with buffered lead acetate on a transparent moving film. The continuously moving film is moisture-conditioned and exposed to the air streams under test. Any hydrogen sulfide present stains the film coating and the stain density is proportional to the hydrogen sulfide concentration. A light beam through the stained film falls on a photoelectric cell, generating an electric current which operates a recording potentiometer. The recorder reads directly in parts per million of hydrogen sulfide.

"Analyzer-Recorder for Measuring Hydrogen Sulfide in Air", E. B. Offutt and L. V. Sorg, Research Department, Standard Oil Co. (Indiana), Sugar Creek, Mo. *Analytical Chemistry*, March, 1955.

Dephenolizing Wastes By A Centrifugal Extractor

This device contacts and separates two liquid phases continuously and countercurrently in the contact elements of a spinning rotor. A light oil is pumped to the outside of the rotor, and the heavier ammoniacal liquor to the center. The centrifugal force, ranging from 2,000 to 5,000 times gravity, sends the heavier liquid to the outside of the rotor, displacing the lighter oil and causing it to flow toward the center, thus intimately mixing them. A 36-in. diameter machine can reduce phenols from 2,000 ppm to 5 ppm and less.

"Dephenolizing of Wastes and Other Liquors by Centrifugal Counter-current Solvent Extraction". By Herbert R. Kaiser, V. P. Podbielniak, Inc. *Sewage and Industrial Wastes*, March.

Carbon Monoxide Measurements

It is sometimes useful to know the amount of carbon monoxide in polluted air, even though toxic amounts do not occur. The National Bureau of Standards colorimetric indicating gel, developed for the detection of carbon monoxide in air, can be used to determine very low concentrations if several refinements of the method are employed. The indicating gel is a granular yellow solid that turns green, and eventually blue, in the presence of carbon monoxide. The indicating gel is usually sandwiched in a glass tube between sections filled with white guard gel. The guard gel is specially purified and dried silica gel which removes interfering substances, particularly water vapor, from the gas to be tested. The indicating gel is prepared from purified silica gel by the addition of palladium and molybdenum salts and subsequent treatment. The field method, widely used where physiological considerations are important, is not sufficiently accurate for careful studies in air pollution. The laboratory method, however, has an accuracy of 5 to 10 percent of the amount of carbon monoxide involved, and can detect and estimate extremely small amounts such as 1 part in 500,000,000. The laboratory method involves a colorimetric comparison with freshly prepared indicating tubes that have been exposed to known concentrations of carbon monoxide. These special tubes are easily prepared and are free from the small variations occurring in commercially prepared tubes.

"Determination of Carbon Monoxide in Air Pollution Studies," Martin Shepherd, Shuford Schuhmann, and Marthada V. Kilday. National Bureau of Standards, U. S. Dept. of Commerce, Washington 25, D. C. *Analytical Chemistry*, March, 1955.

MONTREAL Uncovers Continent's Oldest CAST IRON WATER MAINS

Recent excavations in Montreal, Canada, uncovered the oldest known water mains still in service on the North American continent.

The mains—several thousand feet of cast iron pipe—were laid 138 years ago to replace original wooden mains laid in 1800.

Historically interesting as was this discovery, the record revealed of more than a century-old cast iron pipe service is by no means unique. In Versailles, France, cast iron mains installed in 1664 are still functioning. In Germany there are several authenticated lines in use today after **two centuries** of service! And in many American cities the original cast iron mains are still in perfect condition after serving for generations.

Reason for the long life and long run economy of cast iron pipe is its effective resistance to rust. 'It is the one ferrous metal for water, gas mains and sewer construction that will not disintegrate from rust.

* * * * *

Our Company does not manufacture cast iron pipe, but produces quality iron from which quality pipe is made by many of the nation's leading foundries.

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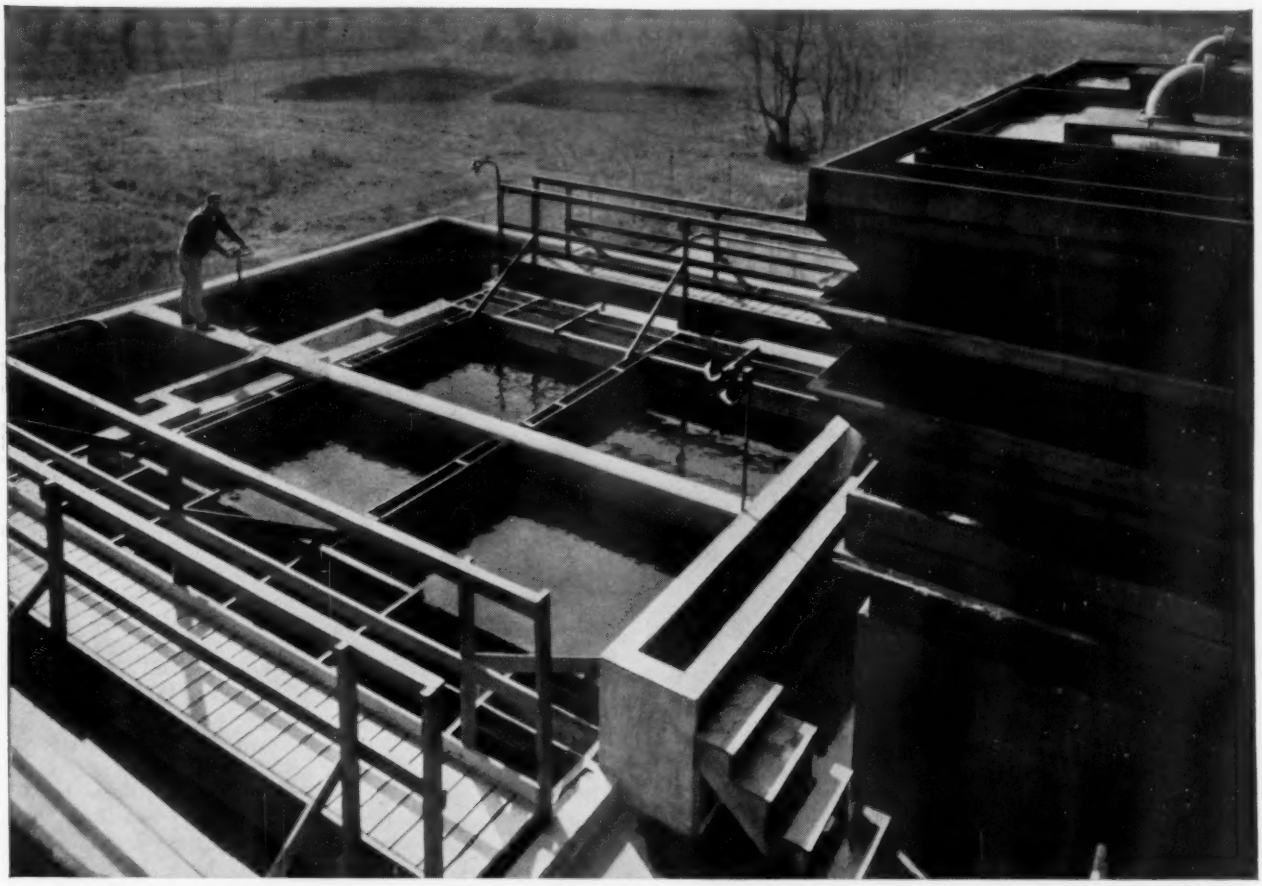

Raw well water with 30 parts per million of iron enters the double coke-tray Permutit *Aerator* (right) which oxidizes the iron and reduces CO_2. Next step is the Permutit *Precipitator* (left) where lime is added to raise pH and precipitate the iron . . . clay to thicken the precipitates. The resulting floc forms a suspended sludge blanket that speeds the chemical reaction . . . makes it more complete. Final treatment is by 5 Permutit Pressure Filters which remove remaining traces of precipitated iron and turbidity to deliver clear, iron-free effluent.

How *Fairless Hills* reduces iron from 30 to 0.14 ppm!

Fairless Hills, Pa., was built from the ground up to a community of 6,500 in less than 4 years . . . yet, because of good planning, there has never been a water supply problem. Before construction began, the search for water was underway.

The first test wells were disappointing . . . couldn't deliver enough. The nearest river water supply was too dirty and within the tidal basin. And when an adequate well water supply was discovered, it was acid and contained not just the usual few tenths ppm of iron but well over 30 ppm . . . 100 times the allowable standard!

Since even a few ppm of iron are considered difficult to handle, 30 parts presents a real problem. Because of the efficiency of its unique sludge-blanket design, a Permutit *Precipitator* was provided under specifications prepared by Consulting Engineer Howard A. LeVan, Jr. of Harrisburg, Pa. The unit was guaranteed to reduce iron to not more than 0.3 ppm.

"Now, the iron content is 0.14 ppm and the pH is 9.0. This equipment is doing a good job," reports H. D. Markle, Chief Engineer for the builders.

"In 29 years around the country, I've seen numerous Permutit installations doing a good job," adds Township Sup't. of Sewage and Water Supply, W. W. Willis.

It's easy to see why you should bring your water problem to Permutit. Address: The Permutit Company, Dept. PW-6, 330 West 42nd St., New York 36, N. Y.

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Yellow Fever—Its Present Status

YELLOW fever seems of little importance or concern, until it suddenly appears in a city, as it did last summer in Port-of-Spain, Trinidad. Then the picture changes overnight. There is great excitement; urgent and often unreasonable measures are taken; past epidemics are recalled; and interest in the disease as a public health menace is rekindled.

In 1928 and 1929—20 years after yellow fever had been controlled and at a time when no apparent threat of reinvasion existed—an urban epidemic of the disease occurred in Rio de Janeiro. Following the epidemic, the Brazilian Government embarked on a program to make all its cities and towns forever safe from this disease. The *Aedes aegypti* mosquito, the only urban vector of yellow fever, is said now to have been eradicated from all the cities and towns of Brazil.

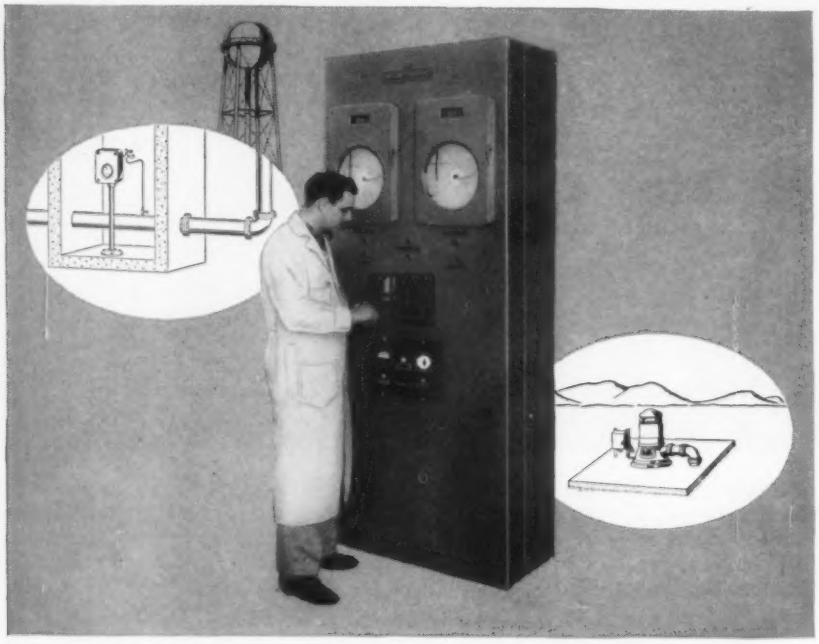
On the recommendation of Brazil, the Pan American Sanitary Bureau, in 1947, initiated a continent-wide campaign to help government eradicate *A. aegypti* from the Western Hemisphere. Today all of Brazil, Paraguay, Bolivia, Chile, Ecuador, and Peru have been declared free of this mosquito, and the campaign is well advanced in the rest of South America. The eradication campaign has begun in Mexico, Cuba, Haiti, the Dominican Republic, and in many Caribbean areas.

In Central America, Panama, Costa Rica, and Nicaragua have been declared free of *A. aegypti*. But north of the Nicaraguan border the picture changes. Small infested areas are found in El Salvador and Honduras, and a much larger one in Guatemala. The aegypti-infested area continues solidly along all of the Atlantic and Pacific coastal regions of Mexico, into the United States, the only country in the Americas harboring *A. aegypti* that has not yet joined in the eradication campaign.

A line drawn from Yuma, Arizona, to the northeast corner of New Mexico, then across the country to the Atlantic at the boundary between North Carolina and Virginia marks the northern limit of the presence of the urban yellow fever mosquito in the United States. The infested area in the United States embraces the whole southern third of the country and is open to the introduction and transmission of yellow fever.

A. aegypti may be considered "domestic." In the Americas it is confined to the vicinity of human dwellings, breeding in artificial water containers. It is, therefore, easily controlled by the use of residual insecticides, such as DDT, which have greatly facilitated eradication. Unfortunately, there are other species of mosquitoes that also transmit the yellow fever virus; these live in tropical jungles. They are found throughout the whole tropical belt of the Western Hemisphere. They infect monkeys, and probably infect certain marsupials, with yellow fever, thus keeping the virus alive and constituting a permanent reservoir and threat. The only protection against the so-called jungle yellow fever is vaccination.

Jungle yellow fever is a direct problem of all the countries on the American mainland with the exception of Canada, the United States, Uruguay, and Chile. It moves in waves, dying down as it kills off or immunizes the monkey population, only to move on and flare up again



SYSTEM SUPERVISION IS SIMPLE AND ECONOMICAL WITH *Synchro-Scan**

ANOTHER B·I·F Blue Chip PRODUCT

Builders-Providence Synchro-Scan Supervisory Control gives you the economy of being able to operate remote equipment from a centralized control station — plus the extra economy of extreme simplicity: — basically right in its design, easy to operate, and easy to maintain.

May we tell you about Synchro-Scan Supervisory Control — the only control with the unique "building block" design. Send, today, for new Bulletin 240-M6. Builders-Providence, Inc., 356 Harris Avenue, Providence 1, Rhode Island.

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Then just dissolve Mathieson sodium chlorite in water, activate it with chlorine or hypochlorite . . . and get a powerful bactericidal agent containing the equivalent of 263% available chlorine!

Used in conjunction with chlorine from a conventional chlorinator, this high potency chlorine dioxide solution, plus any desirable excess of chlorine from the generating process, will solve your water treatment problems.

Moreover, this method saves time and trouble. It permits the introduction of the bactericidal solution right at the desired point of application. Unlike breakpoint or superchlorination, it requires little control or supervision. And it also eliminates the need for carbon and ammonia in the control of taste and odor in municipal waterworks operations.

This method may also be used to maintain a free residual in distribution systems . . . to effect iron and manganese elimination . . . and to control the offensive tastes and odors produced by phenols, algae and industrial wastes.

Mail the coupon for additional information about sodium chlorite's effectiveness and its many money-saving applications in municipal operations.

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Technical grade sodium chlorite, recommended for municipal applications, is available as buff-colored, dry, hygroscopic flakes in 25-lb. pails, 100-lb. drums . . . and 8,000-gal. 50% solution tank-car lots.

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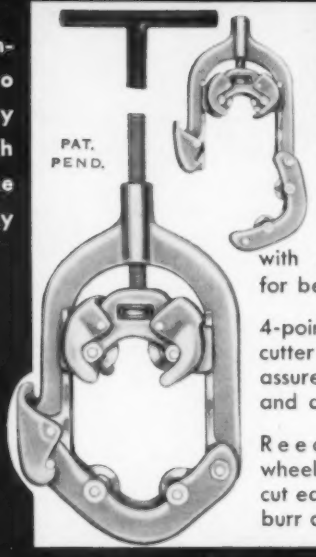
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

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a few or many years later. Such a wave has been moving slowly but steadily up through Panama and Central America since 1948, reviving old memories of the devastating epidemics that preceded the building of the Panama Canal. The present wave reached the northwest corner of Honduras in September 1954. But no human case had been reported in Central America between 1924 and 1948.

This movement of jungle yellow fever northward is very significant because it has approached close to the areas in North America still infested with *Aedes aegypti*. As long as jungle yellow fever exists, there is always the possibility of the movement of an infected person from a jungle area into a city or town infested with the urban mosquito during the 6-day incubation period of the disease.

• • •

Results of Survey on Wisconsin Swimming Pools

The Wisconsin Municipal League recently conducted a survey on the establishment and operation of municipal outdoor swimming pools. The following is a brief summary of the results of this survey covering 28 cities and villages of varying sizes, most of which operate artificial outdoor pools constructed of concrete.

The size of the 28 pools reported ranges from 1,792 sq. ft. to 54,000 sq. ft., the most frequent size being from 10,000 to 12,000 sq. ft. The area of the bathhouse accompanying the pool also varies widely, but usually ranges between 3,000 and 4,000 sq. ft. All but a few of such outdoor artificial pools have some type of filtration system.

The reported original cost of the pool and bathhouse varied widely because of the time of construction and size of the pool. Most of the pools constructed within the last 10 years have cost more than $100,000, and have been financed through general fund appropriations or by the issuance of bonds. A number of pools constructed in the 1930's were built with federal assistance. Only 3 cities reported receiving bequests which covered all or part of costs. The annual cost of operation was found generally to be less than $8,000; 12 cities reported an annual cost of between $5,000 and $8,000 while 11 cities reported that the operating cost amounted to less than $5,000 per year.

Of the 28 cities, 19 reported that adults are charged an admission for use of the pool. The fee usually

ranged between 20c and 35c per person. In 17 municipalities children are also charged for admission, the cost amounting to 10c or 15c. In 12 municipalities residents may obtain season tickets costing from $3 to $4 for adults and from $2 to $3 for children. In most instances the same fees are charged for non-residents as for residents. One city charges only for non-residents' use of the pool.

Most municipalities employ 2 or 3 male lifeguards and 1 or 2 female lifeguards. The salaries of such persons are from $150 to $200 per month.—Wisconsin Municipality.

• • •

Massachusetts Rainfall in 1954

The Massachusetts statewide average rainfall was below normal during the first three months of 1954 but the trend toward a wet spring was established in April when rainfall for the State was 4.68 or 1.06 inches above normal.

Next followed the wettest month of May since 1890 with an average of 7.37 inches, almost double the normal. Precipitation was above normal in all sections. The Boston office of the Weather Bureau reported 13.38 inches the highest figure recorded for any month in the records available for that location. An extremely heavy rainstorm occurring during the night of the 15th caused local flooding in an area around Boston and resulted in considerable damage in the city of Peabody. The Weather Bureau reported the greatest 24-hour precipitation for May amounting to 5.74 inches in 24 hours. New intensity records at Boston for shorter periods were set at 5.54 inches in 12 hours, 4.55 inches in 6 hours, and 2.40 inches in 3 hours. Measurable rainfall occurred at Boston on 18 days, a record exceeded only twice before.

Total 1954 precipitation for the State amounted to 54.27 inches compared with the normal precipitation of 43.88 inches. An examination of records going back to 1890 reveals that this annual total was exceeded only in 1898 when 54.70 inches were received and in 1938 when the total was 54.93 inches.

• • •

New Street Lights for Residential Areas

To keep up with the times, Redwood Falls, Minn., has installed 24 new 4,000-lumen incandescent street lights in residential sections of the municipality.

MAKE YOUR LAWN AREAS "THE PRIDE OF THE TOWN"

E.W.T. SELECTIVE WEED-KILLER

Keep your lawn areas, seeded traffic islands and other improved areas the beauty spots they should be—with E.W.T. *Selective* Weed-Killer. Non-injurious to most grasses, but one spraying in economical solution (a cupful to 24 gallons of water) has proven successful for clearing rights-of-way of poison ivy, barberry, honeysuckle, poison sumac, locust, wild cherry and other persistant perennials and shrubs—including many species of common broad-leaved noxious weeds.

AND . . . WHERE NO VEGETATION WHATEVER IS WANTED . . .

DOLGE SS WEED-KILLER

Ideal for your parking areas and driveways, along fences and abutments. KILLS vegetation and wind-blown seeds on contact, then works down through the soil to the roots, sterilizing the surrounding earth. Here is truly effective, long-lasting protection against unwanted plant growth.

Please write for illustrated, easy-to-understand literature on scientific weed control. Your Dolge Service Man, too, will be glad to answer your questions.

FOR FREE SANITARY SURVEY of your buildings see your DOLGE SERVICE MAN

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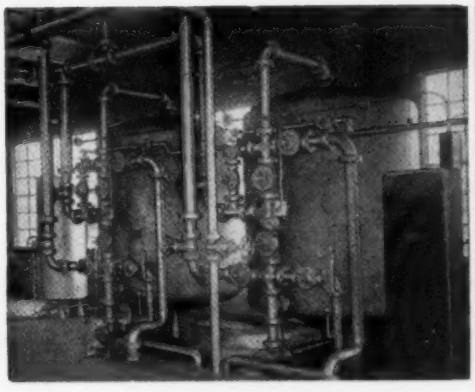
Got a Hard-Water Problem?

LAKESIDE

IS THE ANSWER



Lakeside uses different kinds of zeolites and accessories to meet your particular needs in a softener. Such care insures high capacity, minimum cost, long life and ease of operation. Bulletin 78 tells you a great deal about zeolite softening, including the capacities of the various zeolites, how to determine the amount of zeolite required and how to compute the dimensions for any softening unit.

Sectional drawings show the details of construction of the softeners, and full data are presented on manual, semi-automatic and fully automatic control.

Send for Bulletin 78 now if you have a hard water problem.

LAKESIDE ENGINEERING CORP. 222 West Adams Street Chicago 6, Ill.

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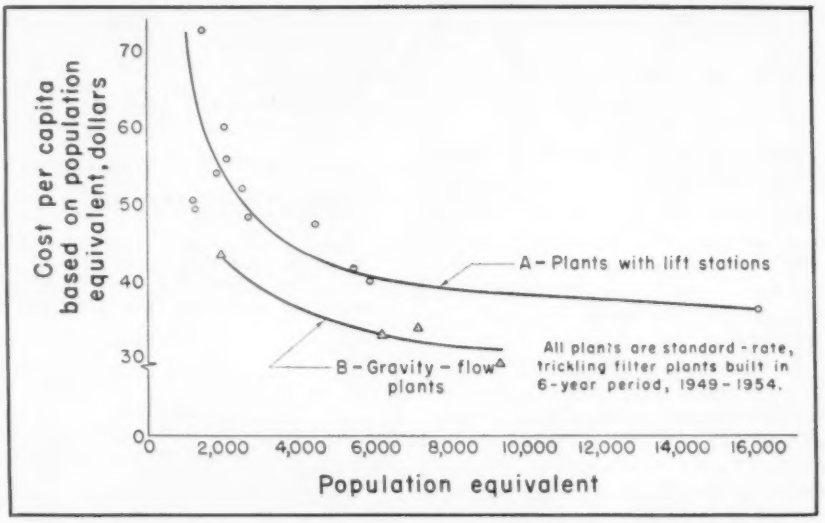
PUBLIC WORKS DIGESTS

The SEWERAGE AND REFUSE *Digest*

Costs of Treatment Plants in Iowa

The authors compiled data concerning 16 sewage treatment plants constructed in Iowa since. 1949. The population figures used in calculating per capita costs are population equivalents. The costs are changed to equivalent 1954 costs on the basis of the Engineering News-Record Cost Index. The plants are practically identical in general design, consisting of a lift station and control building, primary clarifier with mechanical sludge collection, a heated digester, sludge beds, standard-rate trickling filter, and final clarifier. The design population equivalents ranged from 1,200 to 16,000. In general, the unit costs decrease as the populations increase, since some items are common to all plants regardless of size.

"Recent Sewage Treatment Plant Costs in Iowa". By Profs. Paul E. Morgan and E. Robert Baumann. Iowa State College. *Sewage and Industrial Wastes*, March.



Courtesy Sewage and Industrial Wastes

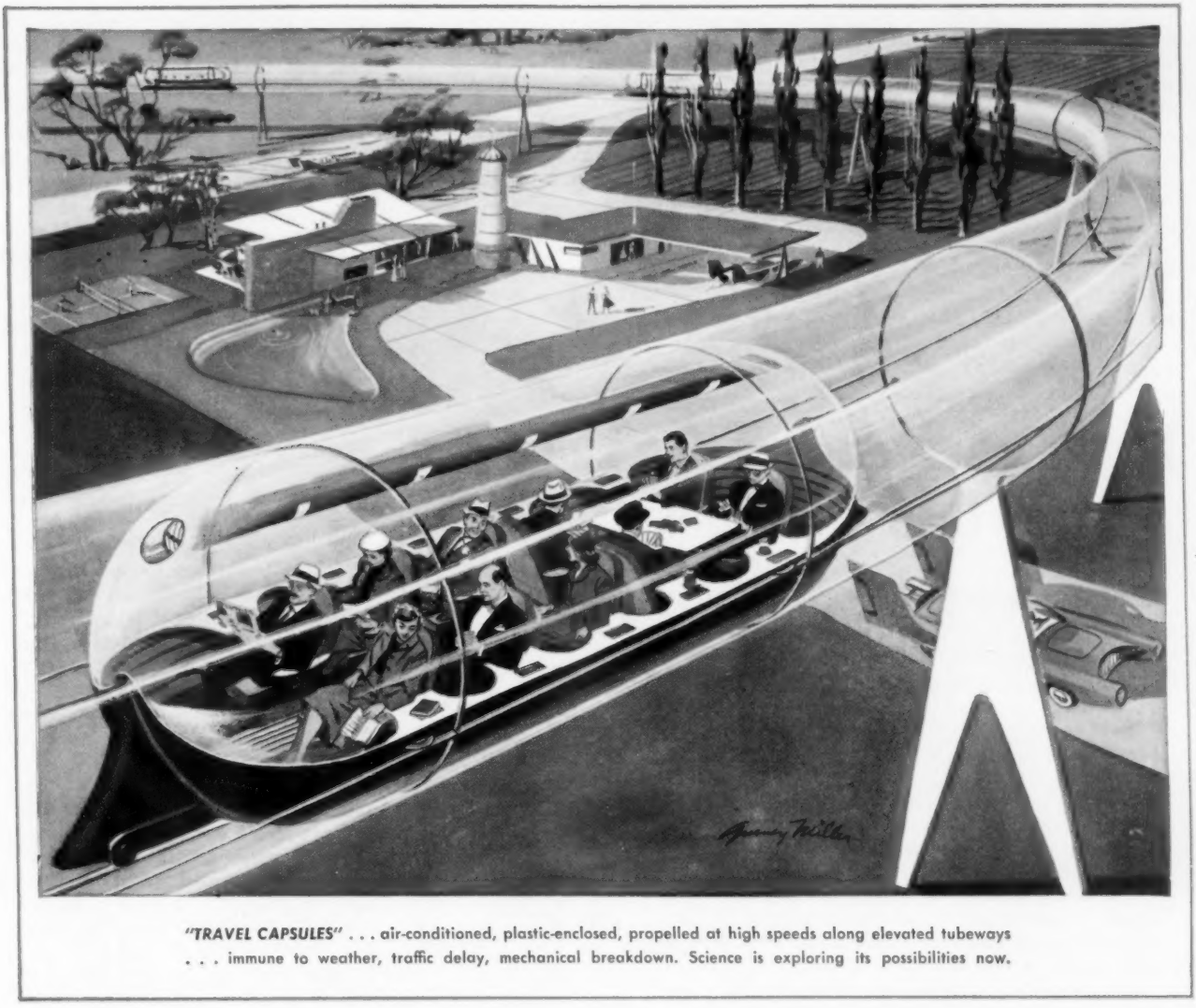
● **Cost of sewage treatment plants, based on population equivalent.**

Multiple Loadings On Intermittent Filters

During the past ten years the use of intermittent sand filters has been on the increase in Florida, and the Sanitary Research Laboratory of the University of Florida has been making a study of this method of treatment. Eight sand filters are used in their experiments, having sands varying in size from 0.25 to 1.04 mm. and depths of 18 and 30 in. Experiments on the effects of varying frequency of loading were made, applying screened and settled domestic sewage to beds of different sand sizes and depths; loadings being applied at intervals of 1 to 24 hours. It was concluded that better BOD removal was obtained from both the 18-in. and the 30-in. beds of 0.25 mm and 0.31 mm sand when the loading increment was increased from once to twice a day; but beyond twice a day the improvement was slight for these sands. However, for beds of 0.45 and 1.04 mm sands, the BOD efficiency was appreciably

Winter Operation of a Sanitary Fill

GARBAGE production recently has increased greatly in Mandan, N. D., near the Williston oil fields. Despite the extremely cold winter weather, disposal has been no problem. Soil is dug during the fall and stockpiled near the sanitary fill site. After the ground freezes, it is necessary only to crush and pack each day's accumulation. An International Drott bullclam then covers it with earth from the stockpile, which freezes only lightly on the surface and is easily broken up. Despite one bleak week when the thermometer did not go higher than 36 below zero, operator Joe Wolf says the refuse has never gone uncovered for a single day. Temperatures go to —44.



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increased when the frequency of loading exceeded twice a day. Under normal Florida conditions, and loaded with primary settled domestic sewage twice each day, filters of sands of 0.25 to 0.35 mm effective size will effectively treat 175,000 gpad; sand of 0.45 mm size will treat 200,000 gpad; and sand of 1.04 mm size will treat 400,000 gpad.

"Intermittent Sand Filters—Multiple Loadings". By Profs. Thomas deS. Furman, Wilson T. Calaway and George R. Grantham, Univ. of Florida. *Sewage and Industrial Wastes*, March.

Sewerage at Roadside Restaurants

Restaurants and service stations have been located on the Ohio Turnpike Project No. 1 at intervals of approximately 30 miles. At each location facilities are provided on both sides of the turnpike, and each pair is served by a single sewage treatment plant and a common water supply. As the sewage effluent is discharged into a dry-weather ditch, a very high degree of treatment is provided. Experience had shown that the sewage to be treated would have a BOD double that of ordinary domestic sewage, and a high grease and detergent content, but much less suspended solids, and temperatures ranging upward to 130° F. Trickling filters were selected for secondary treatment because they are believed to be more amenable to the high grease and detergent concentrations, could more easily handle the wide range of flows, and could be operated with less attention than other types. The amount of flow to be treated was based on the number of seats at the restaurant. The filters will be operated as high-rate filters, the operation of which will be unusual, to meet the problem of extreme variations in rates of flow by means of recirculation.

"Sewage Treatment for the Ohio Turnpike". *Public Works*, May.

Reducing Sewer Infiltration

A study of the available evidence, most of it collected from a large number of engineers by means of questionnaires, led the authors to the conclusion that infiltration to sanitary sewers should be kept to a reasonable minimum, especially the small sizes, which constitute a large proportion (in one case over 90 percent) of the system; that most engineers favor an infiltration limit ranging between 3,500 to 5,000 gal. per mile per 24 hr. for 8-in. pipe. The sewer should be tested to determine whether this limit has been met, in dry as well as in wet ground. Obtaining such a result requires constant attention to workmanship and inspection. For jointing vitrified tile pipes, hot-poured material appears to have the best record. A mechanical joint which needs only to be assembled in the trench has much in its favor, and some of that type may soon be available.

In discussing this paper, C. Gordon Gaither called atention to a report by a committee of the Sanitary Group, Los Angeles Section, Am. Soc. of Civil Engineers. This report specifies causes of infiltration other than poor joints, such as cracked pipe due to yielding foundation, improper backfilling, settlement of manholes, etc.; chemical attack or erosion of pipe; and leaking manhole walls. All pipelines may settle or shift at places, and the joints should therefore be flexible, especially at manhole conections, branch and house connections. Serious consideration should be given to excavating all trenches at least 2 in. below the intended subgrade and filling to grade with pea gravel firmly

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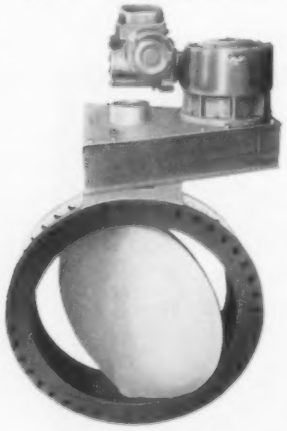
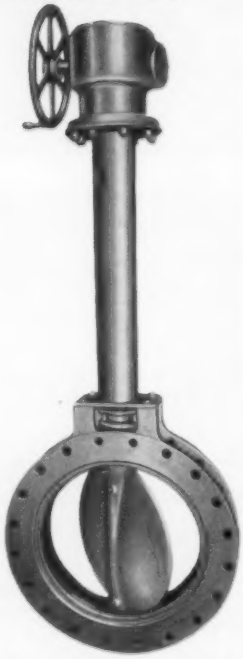


A 54" heavy duty butterfly valve for water supply system; cast iron body fully rubber-lined to effect bubble tight shut-off at 90 p.s.i. The disc shaft of stainless steel in bronze bearing is operated by a gear train and electric motor, with auxiliary declutching mechanism and hand wheel.



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compacted; also to the use of some other kind of piping with fewer joints.

"Infiltration Specifications and Tests". By Charles R. Velzy, and Joshua M. Sprague, Clay Sewer Pipe Ass'n. *Sewage and Industrial Wastes,* March.

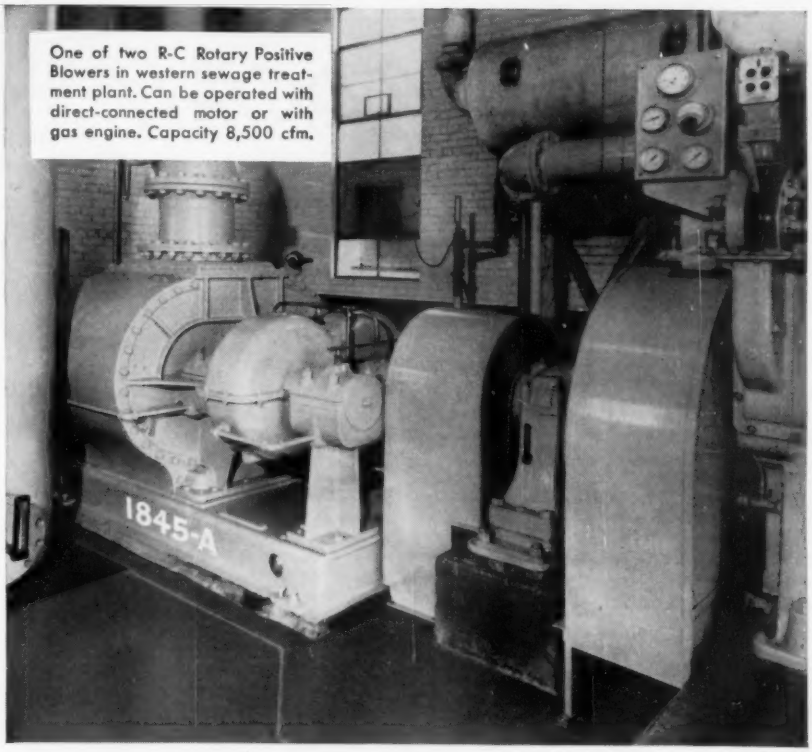
Operation of Oxidation Ponds

At the University of Texas, research has been conducted on the operation of oxidation ponds, types of algae associated with them, biological treatment of laboratory wastes, removal of radioactive isotopes, and the concentration of algae. It is found that algae, in addition to bacteria, will effectively take up radioactivity. For removing the algae, trials have been made of various filter aids on filter leaf and on rotary vacuum filters, of fine screens, and of coagulation. The diatomite filter aid having the largest particle size (Celite 545) gives excellent algae removal. Screening would be cheaper, and promising results have been obtained with No. 325 mesh brass wire cloth in a vibrated screen.

"Oxidation Pond Research". *Public Works,* May.

Maintaining Cleansing Velocity in Transmission Line

In designing a treatment plant for Peekskill, N. Y., the most difficult problem was collecting the sewage from a number of existing outlets and carrying it to a plant site a mile away. Some of the main sewers were 50 ft. above the level of the treatment plant, some were 15 ft. below. A part of the 5800-ft. transmission line is an inverted syphon 20 ft. below the plant level. The plan calls for a collecting chamber — a steel tank 15 ft. in diameter and 50 ft. high into which all the interceptors discharge; those below the level of the treatment plant through a pumping plant. To prevent deposits in the transmission line, arrangements were made to maintain a velocity of at least 2 fps. Two pipe lines are provided, a 12-in. and a 16-in.; the head furnished by the sewage in the collecting chamber could reach a maximum of 35 ft., but much less would produce velocities exceeding 2 fps in the 16-in. pipe at maximum flow. When the flow decreases, the head and velocity decrease; and when the velocity reaches 2 fps, the 16-in. pipe is cut off by a valve and the 12-in. pipe opened, which gives the desired velocity. When the flow in-



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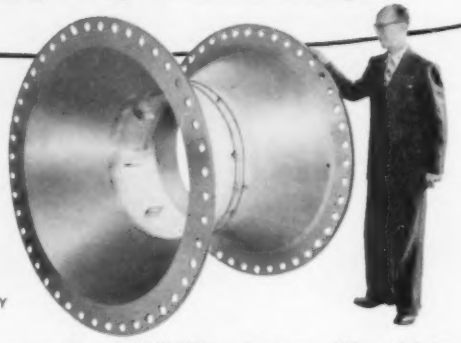

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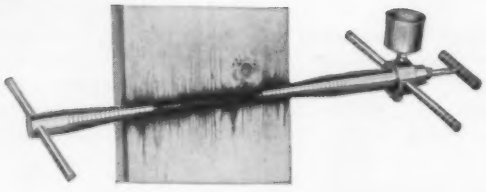

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creases again to give this velocity in the 16-in. pipe, the flow is transferred to the 16-in. line again. The valves for effecting these changes are operated automatically by the liquid level in the collecting chamber.

"Ingenuity Solves Tri-level Sewerage Problem". *Engineering News-Record*, March 31.

Multiple Refuse Containers at Fort Bliss

Prior to 1950, refuse at Fort Bliss, Texas had been collected by standard packer type trucks. Sudden increase in the station's population made it necessary to expand this service, and trial was made of the multiple container system, forty 10-yd. containers being installed at points of heavy refuse generation, serviced by hoist-haul collection trucks. The change was so satisfactory that it was expanded until now about 70 percent of the station is employing this method. The change has reduced the man-hour outlay per cubic yard from 0.228 to 0.111, and further extension of the system now being made is expected to reduce it to 0.08 or 0.09. The system is calculated to be saving about $150,000 annually. A 10-yd. container is placed at each point, which generates at least 10-yd. of refuse a week. There are now in service 216 containers, which are removed by a fleet of 7-unit hoist-haul trucks. All containers are steam cleaned once a week or oftener.

"Multiple Containers Handle Refuse With Less Labor". By H. K. Ripley, Office of the Post Engineer. *Public Works*, May.

Instruments Control Digestion at Hyperion

The Hyperion treatment plant of Los Angeles has a design capacity of 245 mgd. It contains 18 sludge digestion tanks, and to operate this number on a continuous basis would be impossible without fairly complete instrumentation, including flow measurement and control, liquid level measurement, and temperature measurement. Sludge flows are measured using venturi tubes equipped for water purging. Pneumatic transmitters are used for all flow meters and have proved to be simple and trouble-free. Experience has shown that it is desirable to specify automatic reset control for all flow control requirements of sewage sludges. All sludge flows are controlled by Saunders type diaphragm valves; no plugging or

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other malfunction of them has occurred. The difficulties connected with level measurement of sludge digesters tend to exclude such standard devices as visual sight glasses, float actuated instruments, and electrical contact type, and the static pressure type is used at Hyperion. No satisfactory method has yet been determined for compensating for foam or scum. Temperature measurements are made using thermocouples connected to multipoint, push button "Electronik" indicating potentiometers; this system has been completely trouble-free.

"Push-Button Instruments Control Sludge Digestion at Hyperion". By Jack M. Betz, Engineer. *Wastes Engineering*, April.

Another Step in Sewage Treatment

To discharge nitrates into a body of water as part of a sewage plant effluent may be objectionable because they may stimulate the growth of aquatic plants. Karl Imhoff suggests removing nitrates and other fertilizing salts from the effluents of biological treatment as final step in complete treatment of sewage. The only methods of doing this which he considers possible are spray irrigation over wide areas, or the use of shallow ponds from which the floating aquatic plants and settled mud are removed periodically. Each requires so large an area as to be impracticable for large cities.

"The Final Step in Sewage Treatment". By Karl Imhoff. *Sewage and Industrial Wastes*, March.

Salvaging Privileges For Refuse Collectors

Lynbrook, N. Y. gets maximum efficiency from its refuse collection force by providing them with load-packing collecting trucks, proper division of labor between the crews, and—what is less usual—permission for the men to salvage rags, waste paper and scrap iron and so add to their income. The men appreciate this, and the labor turnover is almost nil. Householders are required to tie their waste paper in bundles, and these are not placed inside the packer, thus making room for more of the other classes of refuse. The men maintain a central location where they drop these paper bundles on their way to the incinerator.

"Only Modern Waste Collection Programs Can Use Labor Efficiently". By Floyd F. Wilcox, Com'r of Pub. Wks. *Public Works*, May.

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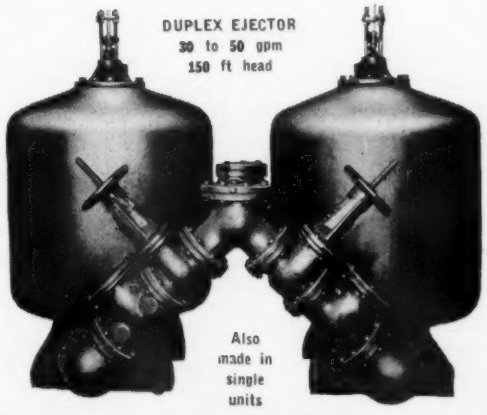

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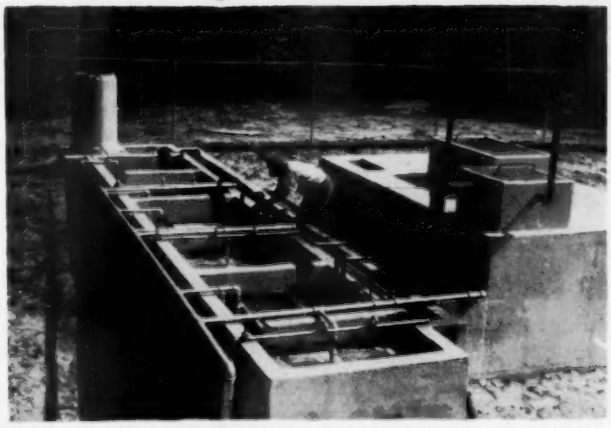

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Phosphorus in Activated Sludge Treatment

A study designed to evaluate the effect of definite phosphorus concentrations on the activated sludge process led the authors to conclude that phosphorus deficiencies cause marked changes in the physical and chemical character of activated sludge solids; especially producing sludges having poor settling characteristics with a predominance of filamentous organisms. The development of an activated sludge is impossible in the complete absence of phosphorus. At a BOD loading of 15.8 lb. per day per 1,000 cu. ft. of aeration capacity and a suspended solids concentration of 1,500 ppm, the phosphorus requirement was 0.8 ppm. This corresponds to a BOD-to-phosphorus ratio of 238, or to 0.44 lb. of phosphorus per 100 lb. of BOD removed from the waste by this method of treatment.

Effect of Phosphorus on the Activated Sludge Process". By Arnold E. Greenberg, Gerhard Klein and Warren J. Kaufman, Univ. of California. *Sewage and Industrial Wastes,* March.

Other Articles

"Open-Air Incinerator Design"; a 250-ton plant at Fort Lauderdale, Fla. By Edmund Friedman. American City, April.

"Flow Measurement in Sewage Works: Principal Devices Used." By Walter H. Brown, Builders-Providence, Inc., and George E. Symons, Sewage and Industrial Wastes, March.

"The Effect of **Frequency of Dosing** on the Performance of Biological Filters". Experiments by the Water Pollution Research Laboratory at Birmingham, England. Contractors Record, March 9.

"Knoxville's Third Creek Disposal Plant". By Guy Browning Arthur. Public Works, May.

"Well-Point System Can Do the Job of **Dewatering**". By G. F. Briggs, Editor, Johnson National Drillers Journal, Public Works, May.

"Water-Borne Aspects of **Infectious Hepatitis**". By C. H. Connell, Prof. of Sanitation, Univ. of Texas. Public Works, May.

"New Plant Recently Installed at Worthing Suggests a New Era in **Refuse Disposal**" by mechanical separation. Contractors Record, April 6.

"Municipal Compost Can Now Be Made in Five Days" by the Dano process, where the refuse decomposes in a revolving drum into which air is blown, controlling the temperature. By Roy Bridger. Municipal Engineering, April 1.

• • •

Insect Control for Texas Roadside Parks

During the summer season insects such as flies and wasps swarm around roadside parks. An otherwise attractive layout loses its appeal when this condition exists.

Last summer the practice of spraying the underside of tables, incinerators, fireboxes, and floor slabs with DDT solution was adopted in Dist. 7, Texas Highway Dept. A substantial reduction in the number of insects around the roadside unit was noted. This spraying was performed each time a park was cleaned.

A 25 percent solution of DDT was mixed with water to give a solution of 5 percent of the chemical. Small sprays manually operated were used to perform the spraying. Approximately five gallons of DDT, costing about $7.50, were used by each foreman in the district. This is considered to be an extremely low expenditure when the increased convenience and comfort gained by users of our parks was considered.

This procedure was described in a short article by R. N. Jennings, District Maintenance Engineer, in Texas Highways.

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PUBLIC WORKS DIGESTS

The WATER WORKS Digest

Handling Chemicals in Bulk

Chicago's South District Filtration Plant during 1954 applied 90 percent of the carbon used in slurry form, and after August 25 most of the alum coagulant used was liquid aluminum sulfate, stored in lead-lined tanks and using lead-lined pumps, piping and feeding equipment. This has been a great saving in handling and maintenance costs, as the cars of liquid chemical are unloaded by compressed air and the liquid feed is controlled with small rotometers equipped with recording charts. There is no carbon dust in the chemical building. Also activated carbon shipped in bulk costs less than when shipped in bags; and liquid aluminum sulfate was about 10 percent cheaper than the solid material. Since concrete is corroded by liquid alum, tanks for holding the liquid were lead-lined.

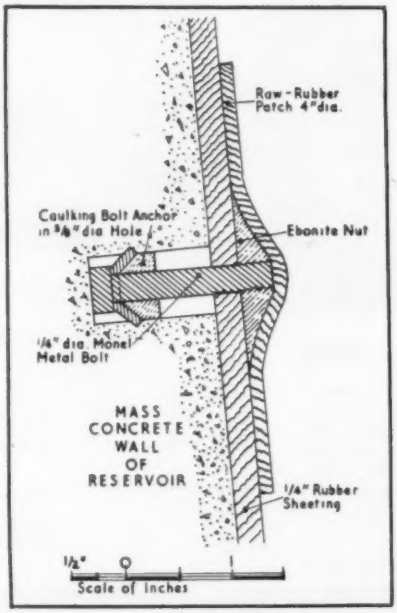
Another change in handling chemicals was made in 1954. Ferrous sulfate gave much trouble by caking in the bins, and it has been stored under water since March, 1954. A bed of granular ferrous sulfate is maintained in the bottom of a tank, and water from perforated plastic piping percolates up through the bed of crystalline material and becomes approximately saturated with ferrous sulfate.

Annual Report of the Water Purification Division, John R. Baylis, Engineer. *Pure Water*, February.

Lining A Leaking Reservoir with Rubber

An English reservoir (known as the Mill Hill) holding 24 mg was built in 1926 over some coal mines, where settlement was not expected, but, beginning in 1938, serious leaking began. The reservoir had concrete walls, floor and roof. Cracks occurred in the floor and construction joints in the walls opened. Various methods of local patching were only partly successful, and it was decided that satisfactory water tightness could be obtained only by covering floor and walls with one continuous sheet of impervious material. This was done in 1953, when 14,660 sq. yd. of rubber was applied, at a cost of £67,960, of which £60,072 was for supplying and placing the lining, and the remainder for work done by the water company in preparing the surfaces and other miscellaneous work. When filled, the reservoir was found to be completely watertight and had remained so for the year previous to the writing of this description.

The rubber was ¼ in. thick, delivered in rolls 4 ft. wide and 25 ft. long. It was not cemented to the floor or walls at any point, but was held in place on the walls by ¼ in. monel metal bolts set in holes spaced about 13 in. apart, using dome-shaped ebonite nuts; each nut was covered with a rubber patch 4 in. in diameter, cemented to the lining. All construction joints and major cracks in the floor concrete were covered with strips of aluminum before laying the rubber.



Courtesy Municipal Engineering

● **Method of securing lining to walls.**

The rubber sheets were butt jointed and the joints covered with rubber straps 3-in. wide.

"Damaged Reservoir Made Leak-Proof With Rubber Lining". By A. G. McLellan. *Municipal Engineering* (England), March 11.

Corrosion Control With Metaphosphate Glass

As a result of research described in their paper, the authors draw the following conclusions with respect to the inhibitory action of metaphosphate: 1. The presence of corrosion products in solution increases the inhibitory action of metaphosphate glass. 2. The increased effectiveness of metaphosphate in the presence of corrosion products can be attributed to increased polarization of the cathodes. 3. The initial action of metaphosphate in short-term laboratory tests may be similar to that of an anodic inhibitor or a mixed inhibitor. 4. When properly used in actual pipe lines, where chemical feed is of long duration, the action of metaphosphate would be that of a cathodic inhibitor. Therefore, this chemical should be considered as a cathodic inhibitor under practical conditions.

"Corrosion Control with Metaphosphate Glass". By James C. Lamb and Rolf Eliassen, Mass. Inst. of Technology. *Jour., New England WW Assn.*, March.

Charges For Public Fire Protection

The authors discuss previous studies and committee reports on fire protection rates, consider erroneous some of the assumptions which form the basis of the systems heretofore proposed for determining charges, and present a method which they believe to be equitable and free from basic error, based on the philosophy that the cost of fire protection should be considered as an incremental cost over and above the cost of general service. The cost so obtained is substantially less

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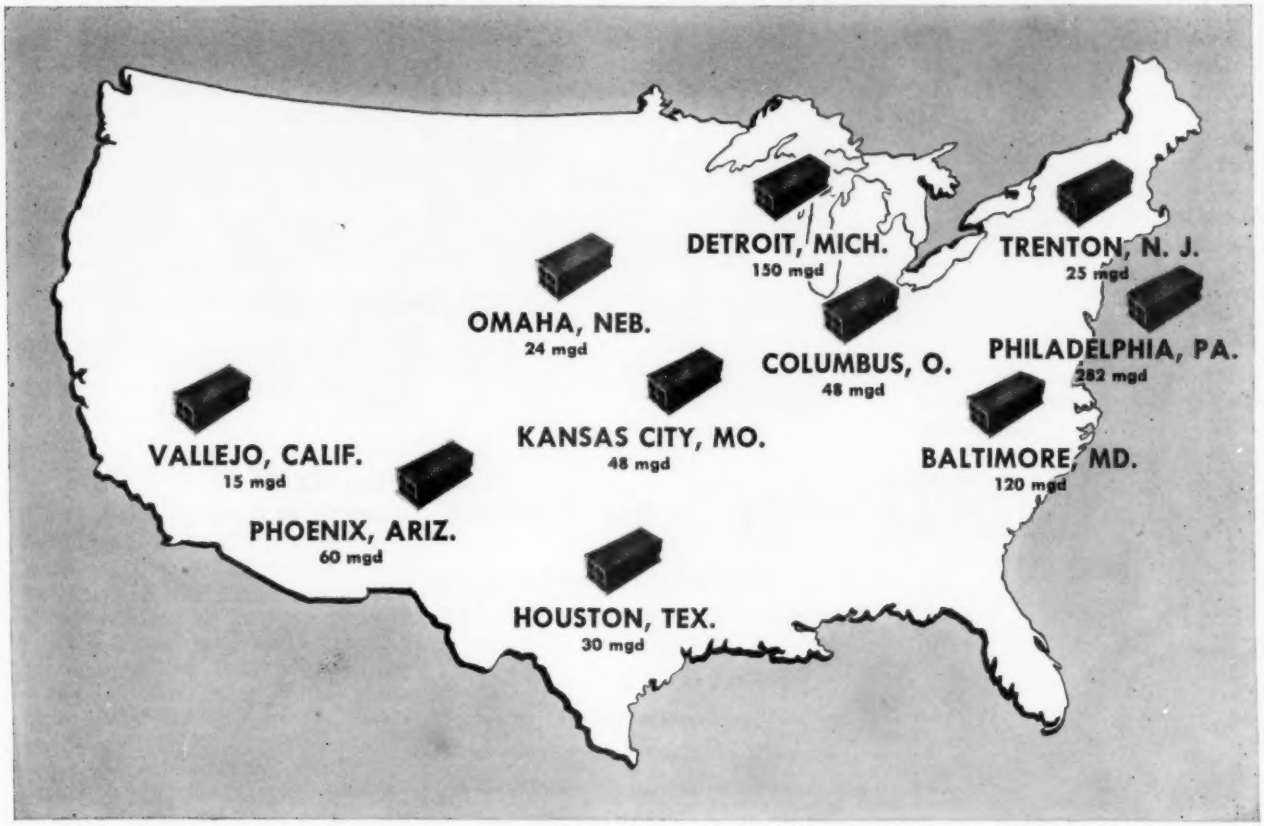

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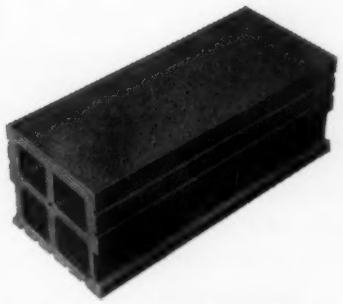

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"Determination of Charges for Public Fire Protection". By Darrell A. Root and Thomas R. Camp. *Journal, New England WW Assn.*, March.

Accuracy of Fluoride Dosage

An investigation was made by the State Dept. of Health of West Virginia to learn how accurately 18 plants applying fluoride to their water supplies were controlling the doses within the specified range of 0.8 to 1.3 ppm. It was found that 86.3 percent of the samples of treated water were within this range, 10.5 percent were underdosed and 3.2 percent were overdosed.

"West Virginia Fluoridation Control Tests." By H. K. Gidley and John H. Miller, Div. of San Eng., State Dept. of Health. *Jour., Am WW Ass'n.*, March.

Result of Fluoridation At Evanston, Ill.

By fluoridation of the water supply of Evanston, Ill. for over four years, the dental caries of 6-8-year old school children have been reduced 46.42 percent, according to records of about 2,500 children, out of a population of about 96,000. The study is to continue for 15 years, beginning in 1946. Sodium fluoride is applied at the rate of 16 lb. per million gallons by a gravimetric feeder. Samples of the water are taken and analyzed twice a day. The cost of the treatment in 1943 was 9¼ cts. per person.

"Fluoridation Reduces Dental Caries in Evanston School Children". By Edwin J. Knudsen. *Public Works*, May.

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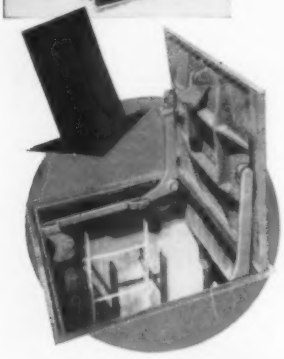

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Filter Plant Controls at Corpus Christi

Corpus Christi, Tex., population over 140,000, is completing a new filter plant with a rated capacity of 48 mgd, a special feature of which is complete automatic, remote and supervisory control which includes more than 50 instruments. The raw water pumps are located a mile from the chemical building, from which they are controlled by a supervisory system, including "start-stop" control, "running off" indication, starter trip alarm and indication, and remote indication and alarm for 8 other functions. Supervisory control is provided for the pumps and valves in the filter building, also. Pneumatic systems were selected for water flow measurements, water level, pressure, chlorine feed, filter rate and loss of head measurement. Electric systems were selected for chemical feed machines, measurement of pH, turbidity and chlorine residual.

"Supervisory Instrumentation Controls New Filter Plant". By Frank A. McCaughan, Consulting Engr. *Water Works Engineering*, March.

Conditioning Water Before Filtration

Other than capacity, the only bottle-neck in a rapid sand filter plant is inadequate mixing and settling. A mixing basin with end-around baffles which provides 30 min. reaction time and a velocity of approximately one foot a minute is entirely adequate. The coagulation basin should be large enough to allow for no less than 4 hours' detention. At Albany, N. Y., difficulties due to undersize of coagulation basin have been overcome by applying lime to the settled water just ahead of the filters, to maintain a pH of at least 8.7. At times of insuf-

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ficient alkalinity, application of limestone flour in conjunction with aluminum sulfate secures complete precipitation of aluminum hudroxide and provides additional nuclei for floc formation. Addition of lime to the settled water at Albany permits manganese removal in the filter beds by adsorption. Proper filter washing requires 50 percent expansion for sand of 0.40 to 0.50 mm, or 40 percent for 0.50 to 0.60 mm sand. Using high wash rates at Albany, the filters have operated almost without interruption for 22 years, with no replacement of filter sand.

"Conditioning of Water Improves Rapid Sand Filter Performance". By Harold C. Chandler, Supervising Chemist. *Water Works Engineering*, April.

Valves on Venturi Meters

There is frequently a decided economic advantage in locating throttling valves in the diffusers of Venturi tubes, as a much smaller valve can be used than one the full diameter of the pipe line. Experiments conducted by the author led to the conclusion that, when used for throttling, a gate valve located half the throat diameter downstream from the pressure connection will adversely affect the discharge coefficient by a measurable amount if the valve is only one-fourth closed. At one-fourth and one-half closure, gate valves located at points 1, 1½ and 3 throat diameters downstream have practically no effect on the accuracy of the venturi tube. The error caused by throttling when the valve is one-fourth closed and half a diameter from the throat vent is about 0.5 percent with the meter reading high; further throttling will increase the error.

"Effect of Downstream Throttling on Venturi Tube Discharge." By Andre L. Jorissen, Head, Dept. of Hydraulics, Cornell Univ. *Jour., Am WW Ass'n.*, March.

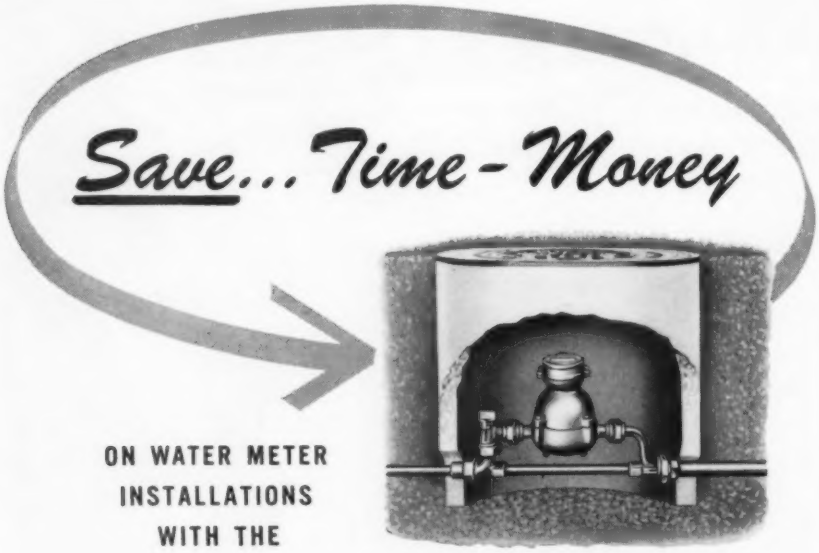
Collecting Data on Frost Penetration

The depth at which water mains and sewers should be laid to avoid freezing is being studied by the Canadian National Research Council, both by data obtained directly by it and by those supplied by engineers in all parts of the country. Such data are obtained by excavation or boring; by placing gauges in the soil which indicate freezing by a rapid change in electrical resistance; and by obtaining the actual temperature of the soil by a variety of instruments. The last has the advantage of permitting the determination of the variation in frost depths with time and allows study of certain factors affecting frost depth. The author describes such studies as made by the Research Council and others.

"Frost-Penetration Studies in Canada As an Aid to Construction". By C. B. Crawford, Nat'l Research Council. *Roads and Engineering Construction*, February.

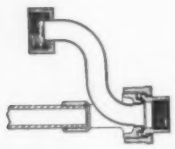
Estimating Construction Costs

During the last half of 1954, contract construction costs went down while wage rates and material prices went up. This must have been due to other influences and the author attempts to identify them, and forecast future trends. One such influence, he finds, is the relation of volume of work to the number of contractors who perform that kind of work. It is possible that present bids are too low to cover costs, overhead and reasonable profit and will not continue much longer. Engineering News-Record construction cost index is quite generally used as a basis for estimating and is prob-



ON WATER METER INSTALLATIONS WITH THE

FORD LINESETTER



Section view of tube end assembly showing double-purpose connection for iron or copper.

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ably as good as any for sanitary engineering projects, but should be supplemented by consideration of auxiliary factors. They probably will continue to rise, as in the past, at a rate approximating 200 points a decade. The most readily obtainable indication of contract cost fluctuations will probably be the ratio of the construction volume index to the number of construction firms.

"Variations in Construction Costs." By Thomas M. Niles. *Journal, Am. WW Ass'n.*, March.

Aluminum Roof For A Reservoir

Santa Ana, Calif. recently constructed a 6,000,000 gal. reservoir. A cover for it would be very expensive; but, in addition to its other well-known advantages, it was thought desirable to exclude any fall-out of radio-active matter from the atmosphere. A cover of aluminum was found to be possible at a cost of less than $18,000. It is so light in weight that it can be supported by an inexpensive structure. The sheets of corrugated 0.032 gauge aluminum rest on purlins 3 in. deep spaced 7 ft. apart, supported by 6-in. diameter steel stanchions.

"Aluminum-Covered Reservoir". By Hugh Foreman, Jr., Director of Public Works. *American City*, April.

Drinking Fountains As Health Hazards

A study of drinking fountains at public schools and other public places, made by the authors, showed that they may be health hazards. The bubble type is a reservoir for bacteria of buccal origin and should be prohibited. Nearly 100 percent of such fountains examined showed streptococci contamination of the bowl, orifice and orifice guard. Next to the bubble type, the angle-jet type without a guard over the mouthpiece is the most objectionable.

"Bacteriological Study of Drinking Fountains." By Prof. W. L. Mallmann and Antone K. Fontes, Michigan State College. *Journ., Am. WW Ass'n.*, March.

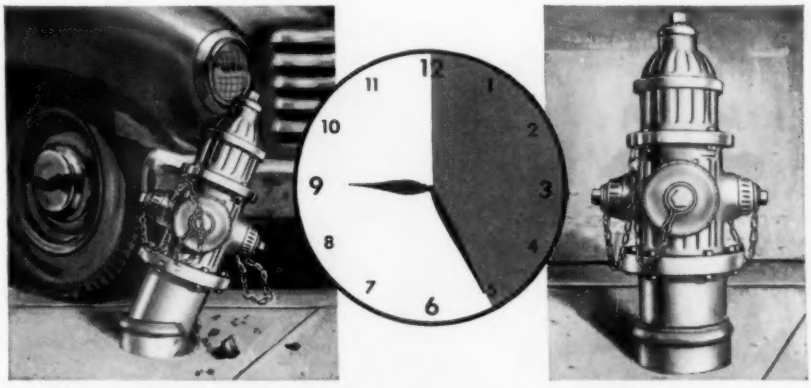
Recharging Ground Water

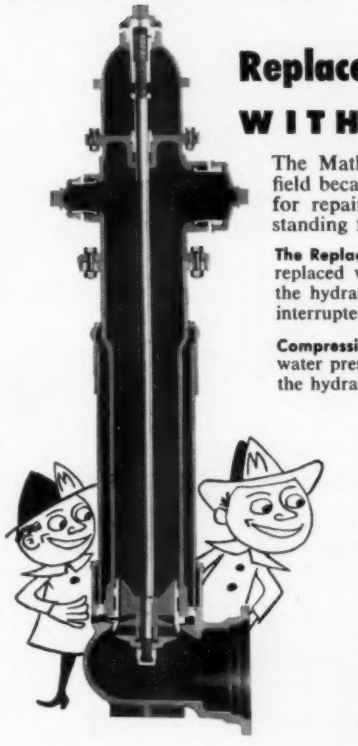
There are at least 87 recharge projects in operation in California. There are several experimental projects in Texas, in some of which water collecting in depressions is drained through recharge wells located in them. Another Texas project consists of building low dams across some streams that flow over limestone outcrop. Another type pumps water in winter from one well field to another closer to town, so that, during peak demands, it will not be necessary to pump so much water from the distant wells. Underground storage, where practicable, has the advantages over surface storage of smaller initial investment, reduction of evaporation losses, and elimination of capacity loss by siltation. Few statistics on costs are available. One estimate for California recharging is that water injected through wells may cost from $15 to $25 per acre-foot; costs of spreading infrequently recurrent flood waters have not exceeded $8.00 per acre-foot for installation and operation.

"Artificial Recharge of Ground Water Reservoirs". By Ralph A. Scalapino, Geologist. *Jour., Am. WW Ass'n.*, March.

Other Articles

"Status of the **Membrane Filter** in the Bacteriolgical Examination of Water". By John H. Bush, Millipore Filter Corp. Jour., New England WW Ass'n., March.





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"Problems of **Corrosion**". By A. G. Smith, Monsanto Chemical Co. Jour., New England WW Ass'n., March.

"How to Secure Maximum Benefits With **Activated Carbon.**" By Albert Y. Hyndshaw, Industrial Chemical Sales Div. Jour., New England WW Ass'n. March.

"The **West Boylston** Water District Water System". By Louis C. Campbell, Supt. Jour., New England WW Ass'n., March.

"Water Use in **Manufacturing**". Summary of data collected by the Bureau of the Census. Public Works, April.

"Eastern **Water Shortage** and Drought Problems". Conditions and countermeasures taken in a number of communities in Ohio and other states. A symposium by a number of engineers and superintendents. Jour., Am. WW Ass'n., March.

"**High-Rate Filtration** Experience at Durham". By Wade G. Brown, Asst. Supt., Water & Sewer Dept. Jour., Am. WW Ass'n., March.

"Flame Spectrophotometeric **Determination of Calcium** in Potable Water Supplies." By E. G. Will and Blanche Schwarzkopf, chemists, State Dept. of Health, Ohio. Jour., Am. WW Ass'n., March.

"**Commercial Records** for small Water Systems," proposed by W. Francis Gordon, Comptroller, Am. WW Service Co. Jour., Am. WW Ass'n, March.

"How **Peak Demands** Are Being Met at Great Neck, N. Y. By Robert M. Grieve, Supt. Water Works Engineering, March.

"**Warren (Ohio)** Has a New Water Plant". By Guy Browning **Arthur.** Public Works, May.

"**Metering** Will Save Water and Provide Planning Data." By Charles F. Killelea, Act. City Mgr., Rome, N. Y. Public Works, May.

Water for the Mississippi Delta Area". Public Works, May.

"**Radioactive Rainfall** Found in Massachusetts" after a Nevada detonation in 1953. By Barnet L. Rosenthal, Lawrence Experiment Sta. Water Works Engineering, March.

"Le Comportement de **l'Ioda et du Fluor** Dans les Eaux", By R. Buydens. La Technique Sanitaire, February.

"**Safety Program** at Chicago, Ill. Provides Significant Benefits". By Thomas F. Allen, Dept. Safety Engineer. Water Works Engineering, April.

"**Booster Areas** in Distribution System of Ottawa, Canada." By C. T. Heeney, Engr. of Water Dept. Water Works Engineering, April.

"Grand Rapids, Mich. Completes First Decade of **Fluoridation**". Water Works Engineering, April.

"**Highest Dam** in Australia (420 ft). Now under Construction". By George Farwell, Eastern Publishers Service. Water Works Engineering, April.

• • •

City Adopts Home Disposal of Garbage

Garbage collections will be eliminated this summer in Grosse Pointe Woods, Mich. An ordinance adopted two years ago required all new homes to be equipped with grinder units for the kitchen sink or basement incinerators. About half of the city's 4,500 homes are now equipped with home disposal facilities and others are buying disposal units privately or through a city contract. The city has an installment plan under which residents buy kitchen units for about $150, paying for them by $5 quarterly payments. The disposal plan is not compulsory, but those using garbage cans will have to arrange hereafter for weekly collections by a private contractor. The city will continue to make weekly collections of bulkier trash, paper, bottles and rags.

• • •

Fluoridation Reduces Tooth Decay

Fluoridation of the public water supply of Dubuque, Ia., has in three years reduced tooth decay in children by as much as 50 percent according to a survey recently made by the State Department of Health.

"Out of sight—out of mind" can be a mighty expensive philosophy in any water distribution system. The above unretouched photograph proves this point. It shows a badly tuberculated *eight inch* main whose *inside diameter was reduced to an average of almost 4.5 inches.* Resultant higher pumping costs with reduced pressure and carrying capacity make it costly to tolerate such conditions. That is why the savings effected in reduced pumping costs frequently pay for the *low cost* of National water main cleaning.

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Organism Resembling P. tularensis Isolated From Water

Carl L. Larson, M.D., William Wicht, and William L. Jellison, Ph.D.

THE demonstration of the presence of *Pasteurella tularensis* in ponds, rivers, and streams in northwestern United States prompted continued study on the distribution of *P. tularensis* in such waters, especially where there have been reports of epizootics in aquatic mammals.

During the course of the studies, an organism, apparently not described in the literature, was detected in a water sample obtained from Utah. This paper describes this organism, for which we propose the name *Pasteurella novicida* sp. nov. In correspondence and in the exchange of cultures, this organism has been referred to as Utah 112.

The organism has certain characteristics that indicate a relation to the organisms contained in the family Parvobacteriaceae, but it cannot be associated directly with any of the various tribes within the family. Morphologically, it has considerable resemblance to *P. tularensis*, being similar in microscopic appearance, in showing considerable dependence upon growth factors in blood, yeast extract or cystine, and in characteristic colonial growth on glucose-cystine-blood agar. The lesions produced in experimental animals and the wide range of hosts susceptible to infection increase the apparent resemblance. Both may be found in natural waters of the western States. They differ markedly, however, in immunological characteristics and may be distinguished by either agglutination or precipitin tests. In addition, *P. novicida* ferments sucrose, whereas *P. tularensis* does not.

There has been considerable discussion as to whether or not the etiological agent of tularemia is justifiably included in the genus *Pasteurella*. At present, it would appear best to leave it in the genus *Bacterium* until its taxonomic position is clarified. We would prefer to place the newly isolated organism in the genus *Bacterium* for the same reason. However, the genus name *Bacterium* is a "rejected generic name" by recent (1954) action of the International Committee on Bacteriological Nomenclature so it is not available. The only alternative to the use of *Pasteurella* would be to establish a new genus name for the two organisms. This we are not prepared to do at this time.

Further examination of natural waters in the western United States, including Ogden Bay, has not resulted in additional isolations of *P. novicida*. Many cultural studies of the laboratory animals maintained at the Rocky Mountain Laboratory have not revealed the organism to be present in the animal colonies, justifying the conclusion that the isolation of *P. novicida* from guinea pigs and mice inoculated with water represented a valid isolation from the water sample involved.

Summary. — A micro-organism highly pathogenic for mice, hamsters, guinea pigs, and rabbits has been isolated from a water sample collected in Ogden Bay, Utah. In gross appearance of cultures, microscopic appearance, and pathogenicity, it closely resembles *Pasteurella tularensis*. It may be distinguished, however, from *P. tularensis* by fermentation studies and by serologic tests. The name *Pasteurella novicida* sp. nov. is proposed.

This is an abstract of a paper which appeared in Public Health Reports.

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Trash Disposal At Roadside Parks

There are approximately 700 roadside parks in Texas. Disposal of the refuse at these was a problem until the Highway Department developed a device for burning and burying it at the park itself with practically no labor. This consists of a portable incinerator with a grate at the bottom through which the ashes, garbage and other refuse fall into a well. When one well fills, another is dug nearby and the incinerator placed over it. The well is a hole 30 in. in diameter and 15 ft. deep, bored with a core drilling machine. A corrugated metal pipe about 3 ft. deep is inserted into the top of the hole to prevent caving. This hole has a volume of 2.72 cu. yd. So far, none of them has been filled. At one popular park, measurement showed an accumulation only 3 ft. deep during a season.

"Trash Disposal Units for Roadside Parks". By E. M. Pritchard, Ass't District Eng'r. *Public Works*, May.

Advantages of Shoulder Lines

A plan for road marking which gives great promise as a safety device is painting a white line 18 in. in from the edge of the pavement as a guide to traffic. Such lines reflectorized are especially useful at night, and permit increased traffic speeds with greater safety. By day, on the other hand, they tend to slow down the pace range. After right-shoulder lines had been painted on a 3½ mile stretch in New York State where the accident rate had been 12-13 per month, the rate dropped to 2-3. This right-shoulder line has been adopted for the Merritt Parkway, Wilbur Cross Parkway, Hutchinson River Parkway, and three parkways in Westchester County, N. Y. Kentucky, Virginia, and other states, 22 in all, have expressed interest in the idea. In painting lines on Merritt Parkway, each crew painted 3 miles per hour of single line, at a cost estimated at $50 per mile of line. In painting 540 miles of line, New Jersey used 7,500 gal. of paint and 15 tons of glass beads. For painting these lines, the New Jersey Department has invented a machine by which the line can be placed at a uniform given distance from the center line.

"A Side-of-Pavement Line". *Engineering News-Record*, April 7.

Soil Conditioners For Clay Soils

It has apparently been proved that trace amounts of certain chemicals, offered as agricultural soil conditioners, can have a tremendous influence on fine-grained soils. With the idea that their use might be advantageous in engineering earth work, the Texas Engineering Experiment Station has conducted tests of the effects of their use with several clay soils, using a miniature Harvard compactor. They conclude that these materials have a potential application for special stabilization problems. Still to be solved will be an economical method for satisfactory field mixing.

"Influence of Some Agricultural Soil Conditioners on Engineering Properties of Clay Soils'". By Lawrence A. DuBose, Texas Eng. Experiment Station. *Roads and Streets*, April.

Recapping or Retreading Rubber-Tired Equipment

Probably the most persistent expenditure in maintaining rubber-tired equipment is the replacement of tires and tubes. Many states report that they save considerable money by recapping tires. By recapping an undamaged carcass they obtain from 50 to 100 percent as much additional mileage as from the original tire. Only sound tires should be recapped. Tires are checked and scheduled for recapping when the tread becomes worn down and smooth. Some departments do not recap tires used on

Automatic Tongs on High-Lift Loader Handle Curbing

ACCORDING to Jack Brayer, Superintendent, Rock Asphalt, Inc., Buffalo, N. Y., the use of automatic tongs attached to a high lift loader saved considerable money in removing curbing, and also made

the operation safer. During repaving, or when the curbing needs replacement, the curb is usually removed about a block at a time, and loaded on trucks for hauling to the stone yard or dump. At the stone yard, curbing is inspected and any that can be salvaged is redressed and stored.

Because of the automatic action of the tongs, which are made by Heppenstall of Pittsburgh, manual handling of the curbing is unnecessary. The bucket carrying the tongs is lowered, with the jaws locked open. When the tongs are raised, the jaws close on the curbing, holding it firmly enough so it can be pulled from the ground and loaded into a truck. A slight lowering of the tongs releases the load.

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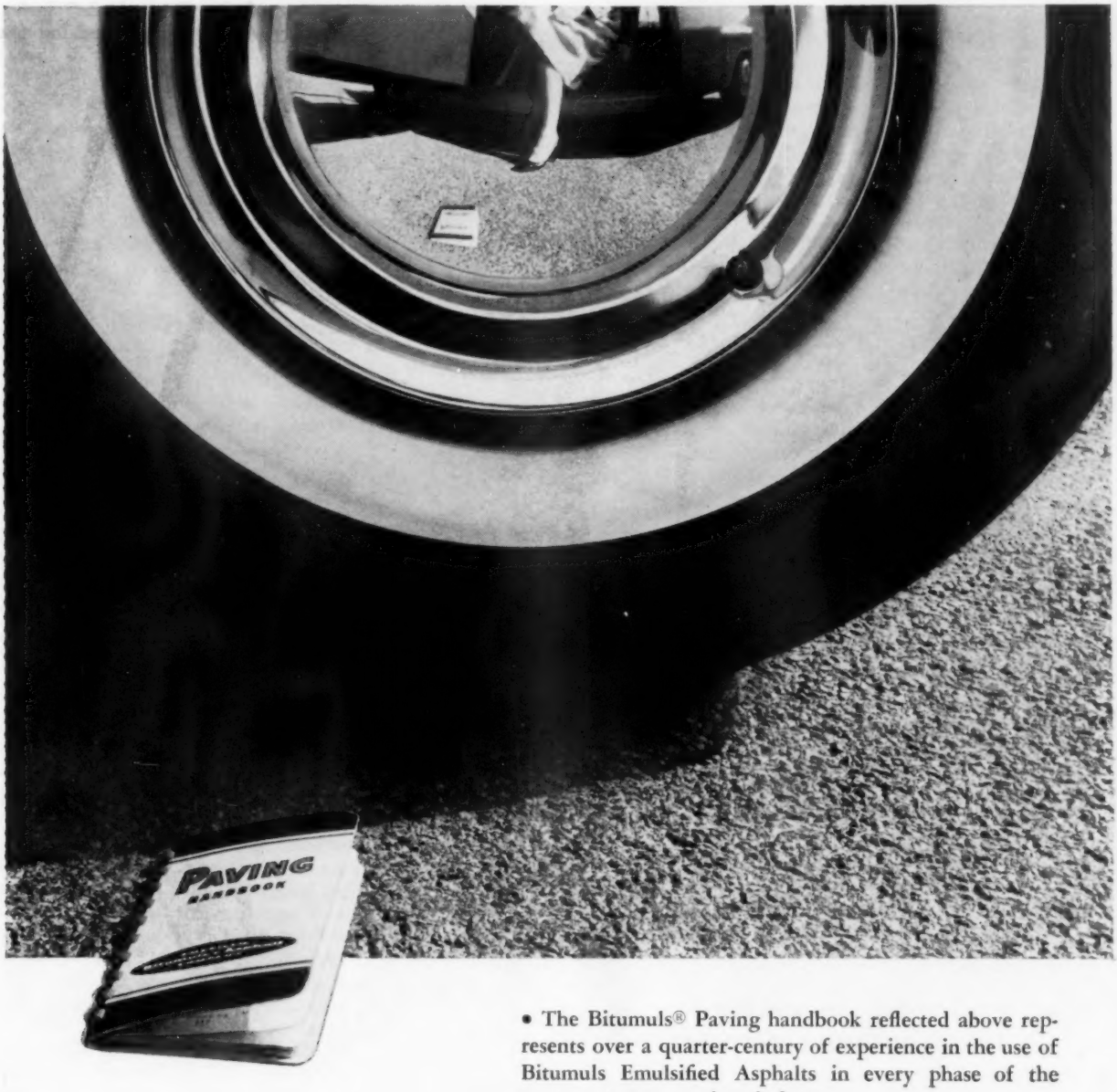

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automobiles and light trucks because of the favorable price they receive on bids for new tires. Others are cautious about recapping fast-moving vehicles. Some do not recap in the summertime because they are afraid that the new material will separate from the old during extremely hot weather. A county engineer in Kansas has recapped a wheel-type tractor for the third time. Reports from fourteen highway officials are quoted.

"Recapping Tires for Road Equipment". *Better Roads,* April.

New Concepts For Rubberized Asphalts

A truly rubberized asphalt is one in which the rubber has been dispersed essentially to the point of colloidal dispersion or molecular solution. Tests and procedures are needed by which rubberized asphalts may be specified, processed, tested, and controlled to standards at least equal to those existing for the asphalt industry generally. The author sees great danger of misinterpretation of conclusions from many of the "test roads" built recently. A test is proposed for toughness and tenacity, and practical levels of values given based on present knowledge. Rubberized asphalt has particularly great potential benefits for seal coats and surface treatments.

"New Concepts for Rubberized Asphalts". By Jewell R. Benson, Consulting Bituminous Eng'r. *Roads and Streets,* April.

Benefits of Controlled Access

Access control preserves capacity and public investment in a highway, provides safer and faster transportation, stabilizes and enhances the value of abutting and other property, and makes possible more economical motor-vehicle transportation.

"What Are Benefits of Controlled Access?" By A. C. Clark, U. S. Bureau of Public Roads. *Better Roads,* April.

Equipment and Materials In Road Construction

The Oregon Highway Dept. requires contractors to give it, in confidence, their road-building job cost records. These data help the department in preparing estimates and in keeping check on the validity of contractors' bids. Recently they have been compiled and studied to lessen the volumes of materials and numbers of equipment units needed to carry out the proposed highway program. Some of these results as calculated by the highway department are given in this article. Of total costs, in 1954 on $5,031,000 of construction, 32.25 percent was for equipment operation — rental, gas, oil, grease and labor. This is broken down into the different classes of equipment — shovels, tractors, scrapers, rollers, etc. Also are given the amounts used, in each class of work, of aggregates, cement, asphalt, lumber and steel; also the dollar percentage for each kind of material and each kind of equipment. Of the materials, aggregates cost 13.6 percent, asphalt 5.2 percent, steel 6.3 percent, explosives 3.7 percent, all other items less than 1 percent. Of the dollar percentage for equipment, trucks cost 11.1 percent, tractors 10.3 percent, rubber-tired equipment 6.0 percent, shovels 5.4 percent, asphalt 1.5 percent, scrapers 1.0 percent, graders 1.6 percent, crusher setups 2.5 percent, drilling equipment 1.6 percent, miscellaneous 3.2 percent; all others less than 1.0 percent. The remaining cost, about 25 percent, was for

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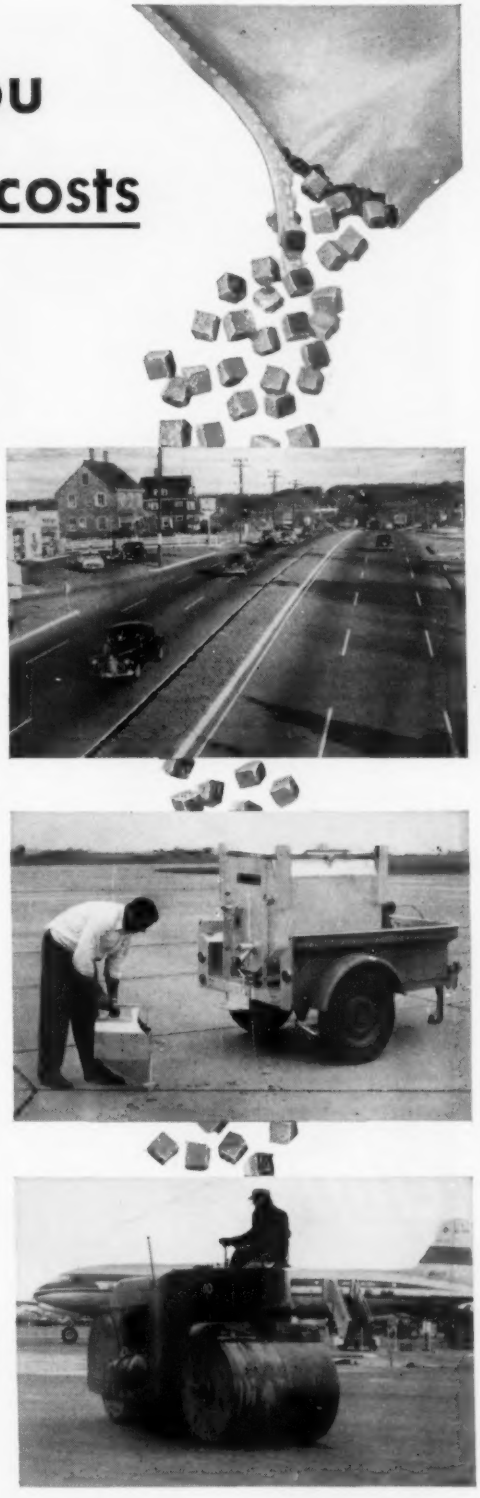

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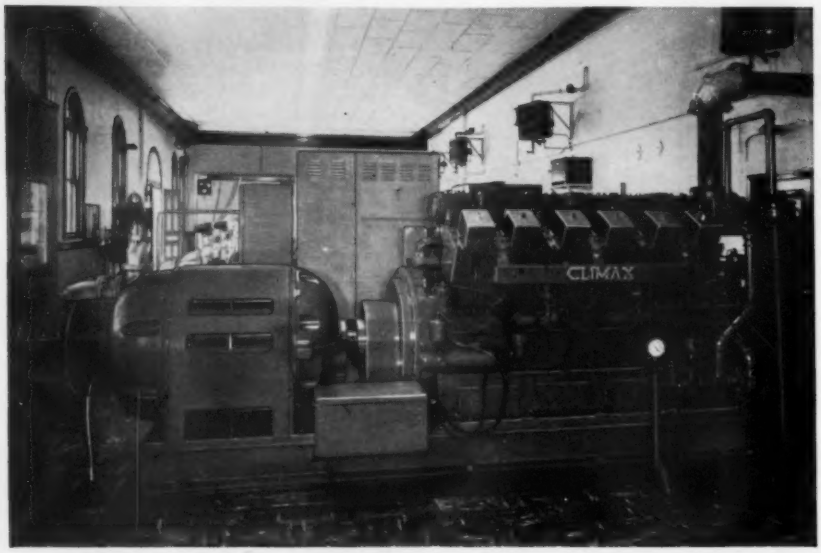

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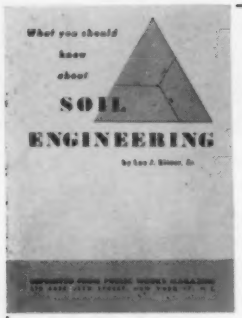

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"Where the Money Goes for Road Equipment and Materials". By R. H. Baldock, State Highway Engineer, *Roads and Streets*, April.

Other Articles

"**Prefabricated Bridges** Reduce Replacement Costs". Public Works, May.

"Precasting **Bridge Slabs** on Barges". Public Works, May.

"**Prestressing** in Road Building". By J. P. Stott, Road Research Laboratory, England. Municipal Engineering, March 25.

"The Development of **Soil-Cement** Stabilization Processes and Plant" at the English Military Engineering Experimental Establishment. By Col. F. H. MacLennan. Contractors Record, March 9 and 16.

"How We Built Minnesota's Longest **Soil-Cement** Project," 239,360 sq. yd. By R. E. Dieseth. Roads and Streets, April.

"**Alkali Lignin** as Emulsion Stabilizer". By W. A. McIntosh and J. J. Kellen, W. Va. Pulp & Paper Co. Roads and Streets, April.

"Use of **Airfield Construction** Experience (in England) In Building Concrete Roads". The Surveyor, April 2.

"**Soil Compaction** and the Performance of Compaction Plant." Report by the British Road Research Laboratory. Public Works, May.

"**Rehabilitating** Concrete Pavements" in Minnesota since 1936. By John H. Swanberg, Eng'r., Dept. of H'ways. Public Works, May.

"How Did We Ever Do Without Our **Two-Way Radio** System?" By W. G. Harrington, County Engr, Scott Co., Iowa. Better Roads, April.

"**Rating** Actual Conditions of County Roads". By Howard G. Minier, Supt.-Mgr., Washington Co., Mich. Better Roads, April.

Subdivision Developers to be Reimbursed

The City Council of Marlin, Texas, has recently established a policy whereby subdivision developers are to be reimbursed according to a fixed schedule for the costs of water and sewer extensions. The developer will be paid annually by the city an amount determined by the number of connections made during the year, after the total original cost is paid by the developer. Maximum sums of $175 will be repaid for each water connection, and $25 for each sewer connection. These figures are the average net revenue received by the city for service over a ten-year period. The reimbursement on each subdivision will continue for this length of time and then stop.

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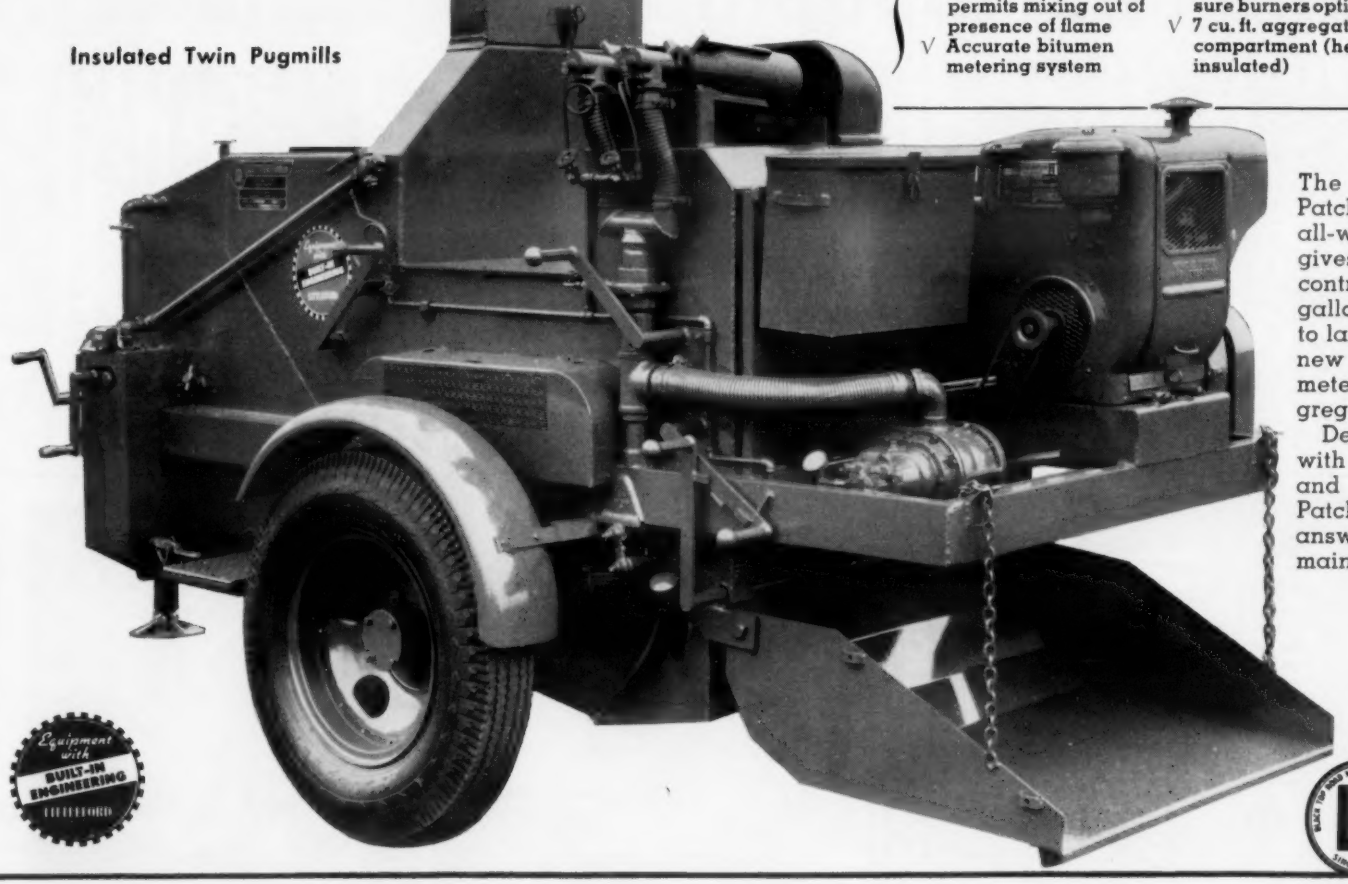

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Tree Trimming, Tree Removal and Roadside Mowing

DURING 1954, a heavy and complete trimming was done on both sides of 68 miles of Wayne County, Mich., primary roads and 16 miles of state trunk lines. Light trimming, including only the work necessary to clear the roads, streets and sidewalks of low-hanging branches, was done on 26 miles of stone-base and secondary roads. The need for brush removal at intersections continued to decline in 1954 as the result of the effective use for the past few years of brush-killer chemicals with kerosene. Maintenance trimming at road intersections for visibility clearance now generally requires only the removal of low-hanging branches. Intersections, nevertheless, are under continuous inspection since certain types of shrubbery are quite resistant to chemicals now in use and sometimes require a follow-up spraying. Trimming trees in Wayne County parks for drive and intersection clearance and for the removal of hazardous limbs over picnic areas was done over approximately 100 acres during 1954.

In 1954, 1,506 dead and dying trees were removed from trunk lines, county roads and parks. Of this number, 477 elm trees infected with and dying directly as a result of Dutch elm disease were removed from all roads and parks. At the request of the Board's Road Construction Division, in connection with the building of stone-base roads, 300 trees were topped by this Division prior to their removal by road construction forces.

Trees along 148 miles of paved county and state trunk line roads and 600 acres of county parks were sprayed in 1954 for control of spring canker worm. Mist sprayers were used to apply insecticides consisting of 25 percent DDT concentrate and arsenate of lead. Roadsides along approximately 100 miles of paved county and state roads and 9 miles of Middle Rouge Parkway were sprayed with a 4 percent to 7 percent solution of dormant oil for control of the hard and soft-shelled scales such as scurfy, San Jose oyster shell, terrapin and European elm scale. The dormant-spray program, done in early spring while the trees were still dormant, required the use of 4,604 gallons of oil.

During 1954, 3,207 gallons of standard elm spray (25 percent DDT) were applied in areas adjacent to trees which had been sampled, laboratory tested and found infected with Dutch elm disease fungus. The object of both dormant and summer applications was to control the vector of the disease, the European elm bark beetle.

Tractor-drawn fairway units were used to mow the urban sections of the superhighways. Most of the single-pavement highways and the Edsel B. Ford Expressway were mowed with tractor side-bar-cutter equipment. The use of this type of equipment is not controlled by the height of the grass and, therefore, the first mowing need not begin until the grass has reached a considerable height and the operation can be geared to not more than two mowings during the summer. Usually, the more rural subdivision streets will get only one mowing late in the summer. A considerable amount of the mowing on the banks of the Ford Expressway was done by two specially-built Worthington tractor mowers designed with a low center of gravity and equipped with dual wheels. These seem to be the answer for steep-bank mowing and more have been acquired for 1955 to help mowing of the increasing mileage of expressways.

A heavy-duty mower of the whirlwind type has been constructed and was used successfully on the steep Davison Expressway banks. It is operated from the upper-level service drives by a truck and winch. A new rotary-type Hammermill mower has been used in conjunction with other power mowers and found to be superior to heavier equipment in rough and inaccessible areas. Furthermore, this type of mower does not kick up stones like most whirlwind mowers.

One spraying per year is usually sufficient to keep most grass areas reasonably free of noxious weeds, but some species, which are normally susceptible to early eradication by the 2,4-D chemical, will build up a resistance to a degree approaching immunity. In this case, the careful application of a stronger chemical such as Esteron brush killer will eliminate the weeds with little or no effect on the desired grasses.

A statistical summary of the weed-control programs for 1954 revealed that 7,410 acres of roadsides, center parkways, and county park areas were sprayed requiring the use of 4,303 gallons of 2,4-D. The average cost including labor, material and

equipment rental was $4.45 per acre.

Maleic hydrazide (MH40), a chemical introduced in the last few years expressly for the purpose of retarding the growth of grass, has been tried the past two seasons in an experimental way. In 1953, it showed great promise for future use as a retardant in grass areas around fixed objects difficult to reach with mowers. The results in 1954, however, were erratic, due apparently to application during a prolonged dry-soil condition. Further testing under all weather and soil conditions is necessary.

• • •

Hereafter It Will Be Virginia Orange

After a study of color visibility, six colors plus the gray now used for equipment painting by the Virginia Department of Highways, were tested against a series of six standard highway backgrounds. The experiment indicated that three colors: Indiana orange, Federal yellow and pure chrome orange were significantly higher in visibility than other orange and red hues. As a result, state highway equipment will hereafter be painted Virginia orange. The Department owns and operates some 10,000 pieces of mobile equipment. Not all of this will be painted immediately—the new color will be used only as repainting is needed. Cost of the new paint will be slightly higher than that of the gray used in the past but the paint is expected to last longer.

• • •

Parking Lots on Outskirts To Relieve DC Congestion

In an effort to relieve downtown traffic and parking congestion the District of Columbia has established three fringe parking lots. The lots, which can handle 1200 cars, are open 12 hours daily, five days a week. The local transit company furnishes express bus service to and from downtown areas during the morning and afternoon peak hours.

• • •

English Brochures on Concrete Roads

The Road Research Laboratory of the Department of Scientific and Industrial Research of England has recently published two "Road Notes" dealing with concrete road construction as developed in that country. One, issued last March, entitled "The Design Thickness of Concrete Roads", reviews the pres-

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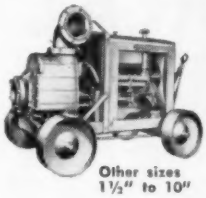

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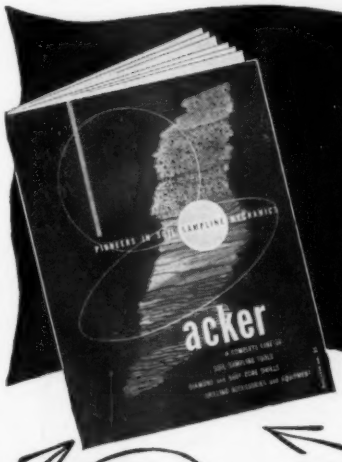

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ent state of knowledge of design factors in concrete road construction. The essential recommendations are summarized in a table which lists the thickness and the amount of reinforcement to be used for a wide variety of traffic and soil conditions. In preparing these notes, the English authors have drawn upon publications of the U. S. Bureau of Public Roads, and data from Germany as well as English experiences.

The other pamphlet is entitled "Testing Concrete by the Ultrasonic Pulse Technique". It describes a non-destructive technique for testing concrete by this method, developed at the Road Research Laboratory. Two transducers are used, placed on opposite faces of the concrete being tested; pulses are timed electrically as they pass from one of these to the other. In the case of roads, the sound pulses are reflected from the lower face of the slab. Copies of these papers can be obtained from the British Information Service, 30 Rockefeller Plaza, New York 20. The price of the latter is 65 cts.; that of the former is about 25 cts.

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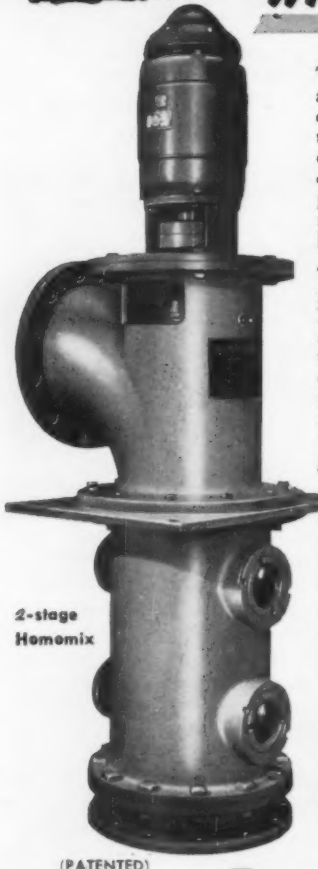
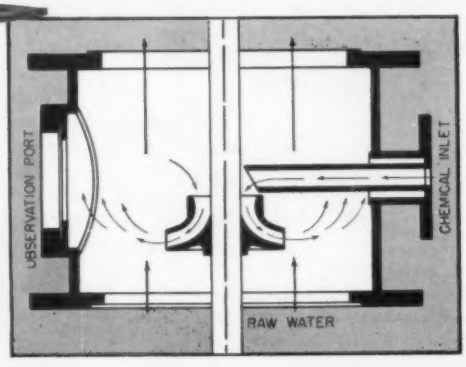


2-stage Homomix

The HOMOMIX gives instantaneous, violent, and uniform mixing of one or more chemicals, or gases, with water. *Immediate, total diffusion*—the most important factor for the efficient and economical addition of chemicals or gases—is obtained *without the use of a mixing tank!* For new plants it eliminates the necessity for costly mixing tank construction; for existing plants it can be effectively used to improve treatment.

The HOMOMIX, in one or more stages, is installed in, and forms part of, the piping. Diffuser impellers rotate in blending chambers and discharge directly across the flowing-through stream. Each chamber has one or more chemical inlet connections and a transparent plastic observation port through which the mixing action is visible. A lifting stage can be provided for additional head, if required. *Write for Technical Supplement HM and Bulletin 300.*



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Swimming Pools

(*Continued from page* 147)

The recirculating pump should be sized to allow 40 feet for dirt pick-up capacity. The expected line losses are added to the 40 feet and the total dynamic head is established. On new pools a 60-foot head pump is almost always large enough, and at a 775 GPM flow a 15 HP motor would be required. Since swimming pools are operated on a continuous 24-hour basis a 1750 RPM motor should be used. A magnetic starter having overload and under voltage protection should be provided.

To protect the pump impeller, a hair and lint catcher is used. A 10-inch hair trap of the basket type with a yoke cover should be used. The basket should be of No. 7 perforated brass with an extra basket supplied because of the time required to clean a basket. A compound pressure gauge is desirable on the downstream side of the hair trap to determine the extent of clogging.

Make-up water should be filtered before entering the pool so as to keep the dirt out of the pool. This is accomplished by means of a make-up water tank connected to the pump suction. The make-up tank may be constructed of concrete or protected mild steel. It should have a capacity of ½ to 1 minute recirculation pump flow (minimum) and a 400-gallon tank with a 6-inch outlet would be satisfactory. The city water line should be sized to supply 775 GPM (if possible) and should be float controlled. The make-up tank should be provided with an overflow connection to the sewer, and a check valve should be installed in the line from the tank to the pump to prevent the pool from backing up into the tank.

The 10-inch flow meter should be directly calibrated from 100 to 1000 GPM, and the orifice type is quite satisfactory for pool work. Because of the generally inexperienced operators, rotameters may offer advantages over mercury manometers. An indicating flow meter is all that is necessary on a pool, and recording flow meters or rate-of-flow controllers are not usually considered.

Gas chlorinators are usually used on a pool this size, and a 35 pound unit (15 pounds for the first 100,000 gallons and 10 pounds for each succeeding 100,000 gallons) would be recommended by most chlorinator manufacturers. The chlorinator and gas cylinders should be located in a separate room which is positively vented by means of a fan.

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Vacuum cleaners are required by public health authorities and should be supplied with enough hose to cover a certain area of the pool from each vacuum fitting, and should include brush, handles, copper floats, and tow rope, inlets and plugs.

The above equipment requires a room approximately 30 feet long, 12 feet wide and 8 feet high. The installed cost of such equipment varies depending on the labor situation, but an estimate of $15,000 would apply to large metropolitan areas.

Operating costs vary depending on labor and electrical rates, and the following percentages generally apply: Electrical consumption, 50 to 65%; chlorine consumption, 15 to 20%; filter aid consumption, 6 to 10%; labor, 3 to 5%; and miscellaneous, 2 to 5%.

Diatomite consumption for the 278,500-gallon pool would be about 28 pounds per day. At a cost of 5½ cents per pound this would equal $1.54 per day. Because no alum is used, alum feeders are eliminated. Soda ash feeders are also eliminated since the pH control problem is reduced to a minimum.

Diatomite filters remove 85 percent or more of the bacteria, and since the filter bed is dumped to waste when the filter is cleaned, chlorine may be introduced after the filter. This results in a lower chlorine consumption to maintain the required free chlorine residual of 0.5 PPM. For best results with regard to eye irritation and chlorine effectiveness a pH of from 7.2 to 7.6 should be maintained.

A recent innovation has been the carrying of high free chlorine residuals—3 to 4 PPM—at high pH values of 8 to 9. Better bacteria counts and no eye-burn are supposed to result, but very close control must be maintained.

Equipment operators vary from high school seniors to physical education instructors and stationary engineers. In general no special abilities are required for the operator. pH control is probably the most difficult item to understand and diatomite filters (by not using alum) minimize the problem. Approximately one hour per day is required for equipment operation and maintenance.

The design engineer should have as his primary thought the ease of maintenance for the pool operator. Valves should be readily accessible. The equipment room should be well ventilated. And with an eye to the future, pipe lines should be oversized.

Pools may be oval, round, rectangular or kidney-shaped, but their beauty is judged by the clarity of their water. The clarity, healthfulness and safety of pools determine their popularity, and a good design which is easily operated assures these features. The design engineer is responsible for this.

• • •

The Millipore Filter

(*Continued from page* 130)

Of the several meetings held at a recent APHA convention in New York concerned with civil defense, and more specifically contemplating the use of biological warfare agents, the common conclusion was that responsibility for adequate monitoring and defense measures must, and does, rest with the state and local health authorities. Great emphasis was placed on methods of early detection of abnormal populations of microorganisms and their early identification. It has been suggested by military experts that our water systems offer an established and highly efficient distribution system for BW organisms, and a more logical means of dissemination than aerosols, which depends on conditions of weather, and wind, etc. We have been repeatedly accused of using germ warfare agents. This can not be without significance, and it could be logically assumed that this may be done to prepare subject people for the acceptance of their usage of this weapon. A weapon which leaves production facilities intact would have an obvious appeal to an enemy bent on world domination.

The water laboratories may represent our first line of defense against disease-producing organisms introduced by an enemy. Discounting the actual introduction of disease producing organisms by an enemy, the devastation of saturation bombing will inevitably threaten the uncontrolled spread of disease. Again the common and ideal carrier would be our water supplies.

Thus, defined MF® procedures represent most reliable and sensitive methods, yielding results in a fraction of the time required by other procedures; and they serve at a reduced cost in routine sanitary control of water supplies. The adoption of these procedures permits the intimate monitoring of water supplies and the rapid initiation of corrective measures where indicated. This latter factor is of incalculable significance in time of peace and is even more compelling in the event of war.

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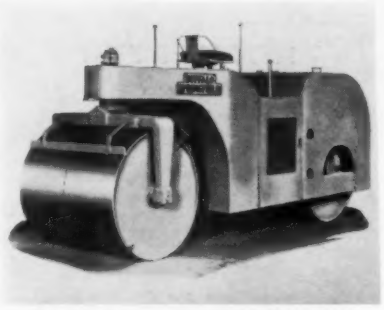
PUBLIC WORKS
EQUIPMENT NEWS

Published Monthly **June, 1955**

Many Improvements Feature New Tandem Rollers

Introduction of a new series of 8-12 and 10-14 ton tandem rollers has been announced by Buffalo-Springfield. They will be known as "Standard" tandems. An outstanding feature of these is their ability to match power and speed automatically to grade and material variations, through use of torque converter drive. The torque converter prevents engine lugging during heavy starts or sudden load increases, and permits engine operation within governed rpm range for peak power, efficiency, and economy. Shock-loads and torsional variations are absorbed. Steady, constant speeds are maintained at any selected speed from 1 to 5 mph, and shifting is eliminated. Through the cushioned drive of fluid, roll slippage is prevented and the shocks and surges of reversing, unavoidable with most mechanical drives, are eliminated.

These new tandem rollers are powered by heavy-duty, industrial-type engines, developing torque over a wide operating range to accommodate all grade and material conditions. The engine compartment is totally enclosed for dust-tight operation, assuring maximum engine protection from harmful abrasives encountered on the job. The control panel is designed to simplify the operator's job and makes it possible for him to be more alert to precise compaction requirements. Full information from any Buffalo-Springfield distributor, by writing Buffalo-Springfield Roller Co., Springfield, Ohio, or by circling No. **6-1** on the coupon.



Tandem rollers in 8-12 and 10-14 ton sizes have torque converter type drive.

New Odorless Cleaner Septic Tank Service

The new model Gorman-Rupp Odorless sanitary cleaner is a packaged pump and tank apparatus for truck mounting, fully enclosed, for clean, quick and easy servicing of septic tanks, cesspools and outside toilets. Consisting of integral pump and tank apparatus, the OSC mounts on standard truck chasses; the pump is Gorman-Rupp self-priming centrifugal, with removable end plate, two vane trash-type impeller to handle solids of 2-inch diameter, renewable wearplate, grease lubricated shaft seal, and Wisconsin air-cooled 21 hp. engine, with electric starter. Tank is 1100 gallons capacity, of 12-gauge steel, with sand drainage sump, manhole cover and safety control limiting fills to 1000 gallons. Positive acting, lever controlled lubricated plug valves regulate flow within piping, pump and tank. Pump connections and piping are designed for both pumping and jetting through a single 3-in. hose or separate hoses, 3-in. suction, 2-in. discharge. Pumping capacity varies with engine speed and job condition and ranges up to 500 gallons at 39 pounds pressure. Full data from Gorman-Rupp Co., Mansfield, O., or circle No. **6-2** on the coupon.

Truck Grader with Anti-Chatter Moldboard

An outstanding advantage of this new underbody grader is its high optional speed of 6 to 15 miles an hour. The manufacturer claims that with such speeds gravel road maintenance "cost-per-mile" can be lowered 30 to 40 percent, as more miles of road can be maintained with fewer machines and operators. Higher maintenance speeds are made possible by levelizing skis located behind and toward each end of the moldboard. These skis and the vertical supporting hydraulic cylinders oppose any tendency for the blade to chatter by absorbing the bounce transmitted by truck

Odorless and sanitary cleaning of septic tanks and cesspools is possible with this packaged pump unit with 1100-gal. tank.

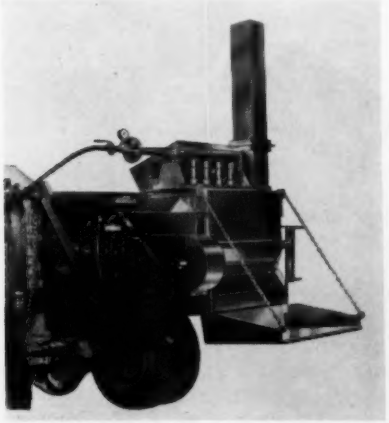
Underbody grader mounted on motor truck utilizes an unique method of eliminating moldboard chatter or bounce.

springs and tires, as well as shocks from the road. For example, when dips in the road surface are encountered, the skis exert an upward force on the moldboard, keeping it in a level plane. Material rolled along by the moldboard fills in the dips and holes. Conversely, when the moldboard strikes humps, the vertical cylinders exert a downward force, causing irregularities to be sliced off. Finger tip pressure on electrical switch levers mounted on the dash panel is all that is needed for controlling the moldboard. It can be raised, lowered, tilted end to end and adjusted properly to the ski from within the cab. More data from Lull Engineering Company, 770 Cedar Ave. South, Minneapolis, Minn. or circle No. **6-3** on the coupon.

• • •

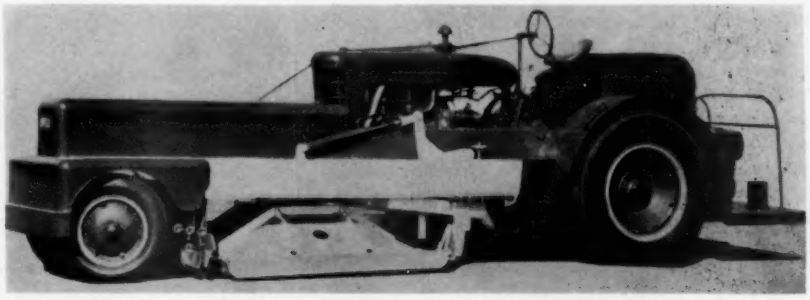
Haul, Mix and Lay Asphalt Surfacing With One Unit

This new McConnaughay asphalt mixer can be mounted quickly on the rear of any standard dump truck and just as quickly removed. It handles up to 5 tons of hot mix or 10 tons of cold mix per hour. When mounted on a dump truck, the mixer is easy to maneuver or to move from one location to another, and a small crew can haul, mix and lay asphalt with this one unit. Width of mixer is 6 ft., depth with shoveling tray up is 2 ft. 6 ins.; depth with tray in working position is 4 ft.; weight is 1160 lbs. More from Asphalt Equipment Company, Inc., of Fort Wayne, Indiana, national distributors, or circle No. **6-4** on the coupon.



Asphalt mixer mounts easily on rear of standard truck for mix and lay work.

Simplifies Asphalt Road Maintenance



Maintenance of asphalt streets and highways and of asphalt runways at airports is simplified. Heating and planing operations can readily be performed in a single pass.

The new model Monatco asphalt heater-planer greatly simplifies the maintenance of asphalt streets, highways and airport runways. It thoroughly heats the asphalt surface, from top to bottom, softens it, and planes off all irregularities—in one operation. Ruts are filled and cracks sealed with pre-heated material. The new level surface can be opened to traffic, or can be re-surfaced if desired. Temperature under the heating hood is held uniform and constant, regardless of how fast the machine may be moving, by a separate motor that operates the blower and fuel pump. Strict control over the air supply eliminates any possibility that the asphalt might be overburned or damaged by the heat—and allows the temperature to be held several hundred degrees higher than was hitherto possible. This extra heat is said to allow more thorough softening and conditioning of the asphalt before the planing blade reaches it. There is no smoke—often a consideration for residents near the right-of-way.

The planing blade, arranged in two sections to windrow in the middle, cuts up to one inch deep and 78 inches wide. The burner takes standard No. 2 fuel oil. Only one operator is required. Both operations, heating and planing, are performed in one pass. Literature and cost operating data from Monatco Mfg. Co., 1401 Woodland, Kansas City, Mo., or circle No. **6-6.**

A Service for Better Usage from your Diesels

A service, established five years ago, provides all kinds of skills and equipment for reconditioning injection equipment for diesel engines. This equipment represents a substantial portion of the cost of smaller diesels. The latest in grinding, lapping and honing tools are used, with air and electrical gauges to measure the very close tolerances that are required in this work; hard chrome plating facilities are also available. Special equipment is used for GM unit injectors for 71 series engines; plungers and bushings for GM injectors of all series; also for American Bosch and International; and for reclaiming Caterpillar pumps and nozzles and Cummins injectors. This is a mail-order procedure, with William H. O'Brien and Robert G. Jeffery, both with long diesel experience, in charge. Reconditioned units are packed in individual cartons for safe delivery. Full details from Hancock Diesel Service Co., 300 Walnut St., Findlay, Ohio, or circle No. **6-5** on the coupon.

"WALK" Lights Stand Out Big and Clear

This new pedestrian signal is easier to see and easier to read. The height of the letters has been increased to 3 inches. The bigger, bolder words are legible across a wide street or from an off-angle.

Bigger and bolder letters give better visibility to this pedestrian traffic signal.

The lenses of the pedestrian signal have been designed in distinctive colors and thus can not be confused with neon advertising signs. The "wait" or "don't walk" lenses are furnished in red or Portland orange. "Walk" lenses are furnished in green or lunar blue. The sharp, square shape of the lens distinguishes the pedestrian signal from traffic lights, store signs and other lighting. It has been established that pedestrians readily identify this signal for just what it is. A new specially shaped prismatic deflector is designed for complete corner-to corner illumination. Since the extremities of the letters are as bright as the center, the words are less likely to be misread. It is reported also that this signal will not blur in a heavy rain but remains clearly visible under all conditions. More from Eagle Signal Corp., Moline, Ill., or circle No. **6-7** on the coupon.

Oliver Has Two Fine New Tractors

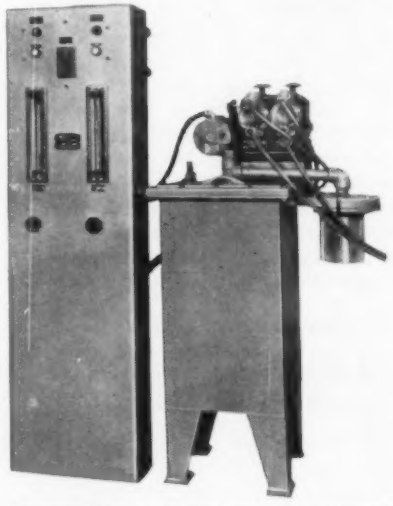
Two completely new industrial wheel tractors—the Models Super 77 and Super 88—have been introduced by Oliver. Both tractors will be available with either gasoline or diesel engine. Gasoline engines are the Oliver 6-cylinder type with compression ratios of 7.0 to 1. Diesel engines start and run on diesel fuel alone and require no auxiliary starting mechanisms or double fuel supply. Power in the Super 77 and Super 88 tractors has been boosted over that of previous models with the Super 77 developing 40.00 dbh and the Super 88 49.81 dbh. The result is a substantial increase in working ability on drawbar and belt.

Transmissions have six forward speeds and two reverse. Other important features are: double-disc differential brakes, bypass cooling, removable wet cylinder sleeves, engine hour meter, auto-type recirculating ball steering and a torsional rubber suspension seat that adjusts by a hand screw to suit the weight of the operator. In addition, the Super 88 operates a hydro-trencher with ½-cubic yard bucket. Complete literature from any Oliver Distributor; from Dept. ST, The Oliver Corporation, 400 W. Madison St., Chicago 6, Ill.; or circle No. **6-8** on the coupon.

Typical of the work that Oliver's two new tractors can do. Both the Super "77" and the Super "88" have more power; the latter also can be used as hydrotrencher.

Omega Introduces Silica Activator

The development of the Model 63 Activator for the continuous preparation and feeding of activated silica, a valuable coagulant aid in water purification and waste treatment processes, is announced by Omega Machine Co. This activator includes all features required for continuous silica activation and is easily adjusted to prepare the activated silica sols most effectively for specific treatment conditions. Once the mixture is prepared in a transparent mixing tank it flows to a separate aging tank for a controlled aging period. The aged activated silica is then diluted for delivery to the point of application. Some of the advantages include a central control panel, for ease of operation; a continuous process, eliminating batching of activated silica sols; and sequence starting. The unit also permits reagent selectivity in the choice of alum, chlorine, sodium bicarbonate, sulfuric acid and ammonium sulfate; a variation of aging concentration and aging time, assuring operational flexibility; and anti-gel interlock which stops activant feed if raw silicate supply fails. Further information from Omega Machine Co., 345 Harris Ave., Providence, R. I., or circle No. **6-9** on the coupon.



Preparation and feeding of activated silica is facilitated by this activator.

Adjustable Coupling Speeds Meter and Valve Installation

Installing or replacing a meter without using undesirable force on the coupling and tail piece and not putting undue strain on the meter or the connecting pipes, is often quite a job. This is especially the case where working space is limited. This Jasco coupling eliminates these headaches. The tail piece is threaded and screws freely into a coupling for the lateral movement required to install meters and gaskets. It also eliminates guesswork. Approximately ½ inch movement is possible, permitting quicker and easier installation, and also eliminating strain and stress on either the meter or the connecting pipe. The manufacturer says that this coupling will quickly pay for itself in time saved. Available through jobbers; or write Jasco Products Co., 8102 Bonner Drive, Houston 17, Texas; or circle No. **6-10** on the coupon.

New type coupling speeds up placement or replacement of water meters.

Two New "Salt Miser" Ice Control Units

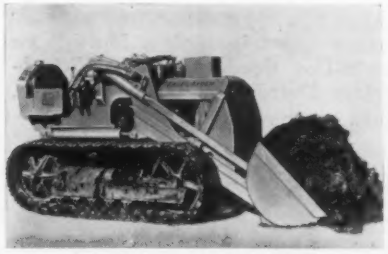
Two new ice control units called the "Salt Misers", have been introduced by the Baughman Mfg. Co., Jerseyville, Ill. Both units can be attached to the tailgate of any standard dump truck. The Model 55 operates on an auxiliary gasoline engine. Material is fed into a hopper; a volume-control valve regulates the amount of feed; and a metering valve delivers the material to the distributor blades. The operator controls spreading operation by a convenient hand clutch. During normal spreading operation the motor runs at idling speed; to increase width of spread, engine speed is increased. The Model 55-H is powered by a hydraulic unit. The spreader remains in a horizontal position when the dump body is raised or lowered. Ice control material (salt, sand, chloride, etc.) slides into the intake opening of the spreader by gravity. Both units are of 11-gauge steel, arc-welded into a complete, compact unit. The metering valve and impeller housings

Get ready for winter: These salt and sand spreaders have new features.

are constructed of stainless steel. A directional vane permits easy control of spread pattern to left, right or rear. Further information from Baughman Mfg. Co., Jerseyville, Ill., or circle No. **6-11** on the coupon.

More Speed and Efficiency With Your Small Crawler Tractor

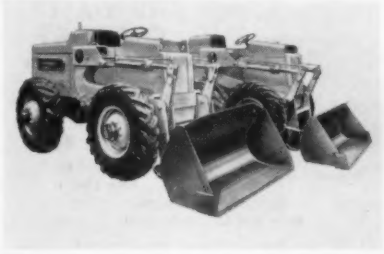
Specially designed for use only on Caterpillar wide tread, long track, D-2 tractors, with non-oscillating track frames, this fully-hydraulic loader provides fast speed-of-lift and increased maneuverability. The TL-20 lifts ¾ yard of material to a clearance of 9 feet (measured at bucket hinge-points) in 6 seconds with break-away power at ground level of 5000 pounds, and 3000 pounds of guaranteed lift to the full 9-foot height. The following Teale attachments can be used with the TL-20: Rock bucket, light-materials bucket, sidewalk snow plow, lumber fork, logging fork, and scarifier and rippers. More from Teale & Company, P. O. Box 308, Omaha, Neb. or circle No. **6-12** on the coupon.



Bucket, plow, fork, scarifiers and rippers go with this end-loader unit.

Two New Four-Wheel-Drive Tractor-Shovels

Two four-wheel-drive models have been added to the line of Hough "Payloader" tractor-shovels. These new machines are the model HU, with one-yard heaped-capacity and the HH, with 1½-yard heaped-capacity. Outstanding among the features of these new models is the design which permits 40 degrees of bucket "breakout". To obtain maximum loads with a minimum of effort, a powerful "pry-out" action is accomplished by using breakout pads on the ground as a fulcrum for leverage. The opposing load forces are thus transferred to the ground through the pads during the "breakout" instead of to the axle, wheels and hydraulic system of the machine. Both of these new models have unusual horsepower and



These two Hough tractor shovels have four wheel drive and plenty of power.

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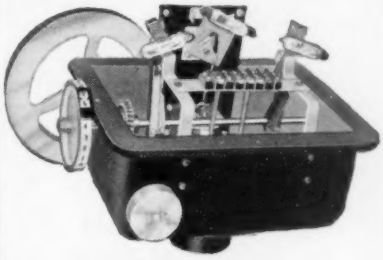

RF-2 with ALTO-TROL

Puts that second pump to work.

A 2-pump RF-2 ROTO-TROL with a built-in ALTO-TROL will operate each pump on alternate starting cycles, assuring equal use and wear of both pumps. Operates both pumps when required. FLOAT-CONTROLLED. Depth Indication optional — extra.

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weight in relation to bucket capacity. The lifting and dumping heights of these new models are higher than average and both units are available with either gasoline or diesel power. Emphasis has been given to driver comfort with adjustable seats which have molded foam-rubber seat and back cushions with a one-piece frame. Both head and rear driving lights as well as tail lights are standard. Details and specifications from The Frank G. Hough Co., 761 Seventh St., Libertyville, Ill., or circle No. **6-13** on the coupon.

Gas Fueled Compound Melting Furnace

This new compound melting furnace is of the Jumbo type, and when equipped with a 14-in. guard, and the new 5-gallon capacity compound pot, is claimed to offer the contractor a light weight, instant lighting heater that has many advantages over wood or oil compound

Provides quick and easily controllable heat for melting jointing compounds.

heaters. For instance, if a pitch kettle boils over with a wood or oil furnace, the resulting fire is very hard to control, but with Insto-Gas you can shut off the furnace flame immediately. However, Insto-Gas has a flame control that reduces the fire hazard by preventing the compound from boiling over.

There are many uses for this new Insto-Gas compound furnace, such as: Melting asphalt or pitch for roofs; tar for sealing seams in concrete; compounds for treating block floors; compounds for setting machinery; and jointing compounds for clay or cast iron pipe. More from Insto-Gas Corp., 1977 East Woodbridge, Detroit 7, Mich., or circle No. **6-14** on the coupon.

Locates Valve and Curb Boxes Quickly

The new valve box locator by Aqua Survey & Instrument Company locates valve and curb boxes

Finding valves and curb boxes can be easy, even with grass, fill or snow.

quickly and accurately. Ground cover—overgrown grass, concrete walks, fill-ins, slides, heavy ice or snow—does not interfere with its ability to locate the boxes. The new unit has the Aqua electric braking which eliminates "needle nervousness" and speeds up the locating process. It is equipped with a shoulder strap which allows reading to be taken quickly from the normal standing position. Each unit is factory adjusted to the geographical location in which it will be used. Data on free trial from Aqua Survey & Instrument Co., 2012 Worth Ave., Cincinnati 12, Ohio, or circle No. **6-15** on the coupon.

Soft Flame Super Torch

Contractors who need equipment for heating sand will find the Insto-Gas No. 6. Torch will produce a flame 36 ins. long that can be used direct on a sand pile, or will burn inside a pipe covered with sand. It produces a large soft flame; the maximum capacity is 150,000 btu per hour. More from Insto-Gas Corp., 1977 East Woodbridge, Detroit 7, Mich., or circle No. **6-16** on the coupon.

Scraper Fits All 3-Point Lift Tractors

Solidly constructed of all-welded heavy-duty mild steel plate, the Gannon economy scraper features a curved mold board, high-carbon steel and backfill blades and six adjustable ripping teeth held in position by positive locks. It can be used to scrape, scarify or backfill, the first two operations simultaneously if desired. Weighing 500 lbs. and with a 65-inch cutting width, it fits Ford, Ferguson and all 3-point lift tractors. More by writing to Earthcavator Company, Inc., P. O. Box 5, Downey, Calif. or circle No. **6-17** on the coupon.

Traffic Control System With Simple Wiring

A new type of traffic control system has been installed in Moline, Ill., which handles the week's traffic program of up to 60 signal changes by means of a 2-wire interconnecting cable. It is said that a city requiring a 21-intersection hook-up can install this "Monotrol" system over existing wiring at a cost of about $15,000 for labor and equipment. With this 2-wire installation, fire, police and ambulance routes can be opened immediately for the driver of an emergency vehicle. He calls for the desired route by radiophone and the push of a button on the master controller opens the route with a string of green lights.

This control unit can handle your street traffic control problems.

Other functions are offsetting lights at successive intersections to speed traffic, favoring heaviest traffic flows; and use of flashing red and amber lights during off hours. All this is done from a central point. Galesburg, Ill., and Waltham, Mass., are also reported to be installing this system. More from Eagle Signal Corp., Moline, Ill., or circle No. **6-18** on the coupon.

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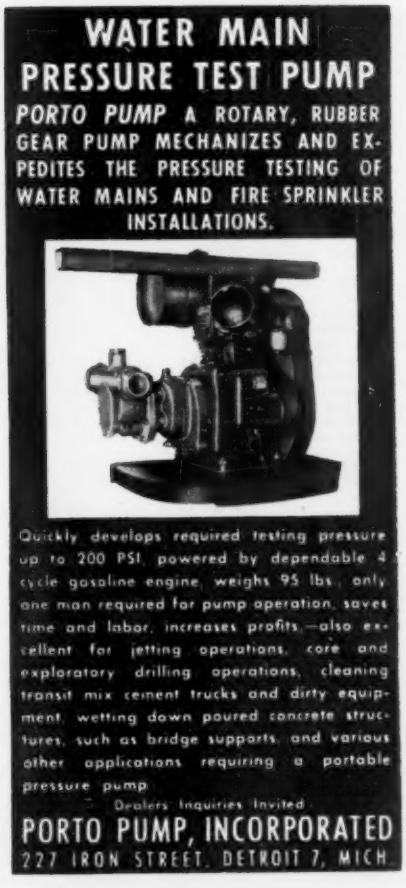
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INDEX OF ADVERTISEMENTS

Abrams Aerial Survey Corp. .....158 & 213
Ace Pipe Cleaning, Inc. 221
Acker Drill Co., Inc. 211
Adams Co., Inc. R. P. 64
Air Placement Equip. Co. 164
Air Survey Corp. 213
Alabama Pipe Co. 219
Albright & Friel, Inc. 213
Allied Chemical & Dye Corp. 165
Allis-Chalmers Co. .....20, 21 & 45
Aluminum Company of America 81
Alvord, Burdick & Howson 213
American Bitumuls & Asphalt Co. 205
American Cast Iron Pipe Co. 104
American Hot Dip Galvanizers Co. 102
American-Marietta Co. 49
American Playground Device Co. 58
American Vitrified Products Co. 31
American Well Works 212
Ammann Photogrammetric Engrs., Inc. .. 199
Anthracite Equipment Corp. 160
Associated General Contractors of America, Inc. 98
Austin Western Co. 29
Automatic Signal Division 79
Eastman Industries, Inc.
Ayer-McCarel Clay Co., Inc. 62

B/W Controller Corp. 44
B-I-F Industries .....170, 172 & 184
Baker, Jr., Michael 213
Bannister Engineering Co. 213
Barber-Greene Co. 43
Barker & Wheeler 213
Baughman Mfg. Co. 195
Bell, Howard K. 213
Black & Veatch 213
Blackburn Smith Mfg. Co. 193
Blaw-Knox Company .....46 & 100
Blackson Chemical Company 53
Bogert & Childs 213
Bowe, Albertson Assoc. 213
Bowerston Shale Co. 62
Brown & Assoc., Floyd G. 213
Brown & Blauvet 213
Brown Company 57
Brown Engineering Co. 213
Buck, Seifert & Jost 213
Buffalo Meter Co. 225
Builders-Providence, Inc. .....172 & 184
Burgess & Nipple 213
Burke, Inc., R. H. 213
Burns & McDonnell Engr. Co. 213
Byron Jackson Co. 103

Caird, James M. 213
Calgon, Inc. 77
Camp, Dresser & McKee 213
Cannelton Sewer Pipe Co. 62
Capitol Engineering Corp. 213
Cast Iron Pipe Research Assoc. .....8 & 9
Cataphote Corp. 210
Caterpillar Tractor Co. .....4 & 106
Centriline Corporation 28
Champion Corp. 94
Champion Mfg. Co. 70
Chapman Valve Mfg. Co. 78
Chester Engineers 213
Chicago Bridge & Iron Co. 153
Chicago Pump Co. 3
Clark-Wilcox Co. 160
Classified Ads 220
Cleveland Trencher Co. 34
Climax Engine & Pump Mfg. Co. 208
Clow & Sons, James B. 15
Cole & Sons, Chas. W. 213
Consoer, Townsend & Assoc. 213
Conveyor Co. 32
Cotton, Pierce, Streander, Inc. 214
Cole Mfg. Co., R. D. 102

Darby Corp. 168
Darley & Co., W. S. 220
Darling Valve & Mfg. Co. 16
DeLeuw, Cather & Co. 214
Dempster Brothers, Inc. .....22 & 23
Detectron Co. 48
Dickey Clay Mfg. Co., W. S. 62
Dolge, C. B. 187
Dresser Industries, Inc.
(See Roots-Connersville Blower Corp.)
(See Dresser Mfg. Div.)
Dresser Mfg. Div. 101
Dorr-Oliver, Inc. 66
Dratt Mfg. Co. .....12 & 13
du Pont De Nemours & Co., Inc. E. I. 74

Eddy Valve Co. 52
Enterprise Engine & Machinery Co. 85

Fairbanks, Morse & Co. 76
Federal Sign & Signal Corp. 206
Fischer & Porter Co. .....72 & 73
Fisher Research Lab. Inc. 178
Fitchburg Engineering Corp. 61
Flexible, Inc. 195
Ford Meter Box Co. 200
Foster Engineering Co. 192
Foxboro Company 92
Fridy, Gauker, Truscott & Fridy, Inc. 214

Gannett, Fleming, Cordroy & Carpenter, Inc. 214
Gar Wood Industries, Inc. .....54 & 55
General Electric Co. 18
Gilbert Associates, Inc. 214
Glenfield & Kennedy, Ltd. 105
Golden Anderson Company 224
Graver Water Conditioning Co. 27
Greeley & Hanson 214
Green Co., Howard R. 214
Greenlee Bros. & Co. 192
Gruendler Crusher & Pulverizer Co. 94
Grote Manufacturing Co., Inc. 33
Gulf Oil Corp. 19

Hagan Corp. 77
Hardie Mfg. Co. 56
Harley & Assoc., Frank E. 214
Harte Co., John J. 214
Havens & Emerson 214
Hays Process Co. 193
Hazen & Sawyer 214
Healy Ruff Co. 219
Heil Co. 99
Heltzel Steel Form & Iron Co. 97
Hill & Hill 214
Homestead Valve Mfg. Co. 26
Hooper, William T. 214
Hotel Tuller 186
Hough Co., Frank G. .....82 & 83
Hunt Machine Co., Rodney 95

Infilco Inc. 14
International Harvester Co. .....12 & 13
International Salt Co., Inc. 93
Irving Subway Grating Co., Inc. 30

Jackson Vibrators, Inc. 157
Jaeger Machine Co. 211
Jasco Products Co. 44
Jeffrey Mfg. Co. 150
Johns Manville 71
Jones Co., John Wiley 84
Jones, Henry & Williams 214
Josam Mfg. Co. 69

Keasbey & Mattison 65
Kennedy, Clyde C. 214
Kerrigan Iron Works, Inc. 68
Knowles, Inc., Morris 214
Koshring Company 48

Lakeside Engineering Corp. 187
Leopold, F. B. 197
Le Roi Company 2
Le Tourneau-Westinghouse Co. 166
Lewis, Harold M. 215
Link-Belt Co. 6
Littleford Bros., Inc. .....50 & 209
Lock Joint Pipe Co. 87
Lozier & Co. Wm. S. 215
Lucas Asphalt Compactor Co. 186

M-B Corp. 159
M. & H. Valve & Fittings Co. 171
Magee-Hale Park-o-Meters 47
Maintenance Co., Inc. 220
McWane Cast Iron Pipe Co. 174
Metalab Equipment Corp. 60
Metcalf & Eddy 215
Milipore Filter Corp. 152
Modern Swimming Pool Co., Inc. 162
Morse Bros. Machinery 176

Motorola Communications & Electronics, Inc. 39
Mueller Co. 25

Natco Corp. 62
National Clay Pipe Mfrs., Inc. 179
National Water Main Cleaning Co. 202
Naugatuck Chemical 207
Neenah Foundry Co. 100
Northern Gravel Co. 24
Norton Company 51

Olin Mathieson Chemical Corp. 185
Oliver Corporation 75
Omega Machine Co. 170
Orangeburg Mfg. Co., Inc. 161

Pacific Flush Tank Co. 89
Pacific States Cast Iron Pipe Co. 174
Pak-Mor Mfg. Co. 175
Palmer & Baker, Inc. 214
Palmer Filter Equip. Co. 163
Permutit Company 183
Pipe Linings Inc. 67
Pirnie Engineers Malcolm 215
Pitometer Company 215
Pittsburgh Des Moines Steel Co. 167
Pittsburgh Equitable Meter Div. .....35 to 38
Phelps Dodge Refining Corp. 91
Phelps, Inc., Boyd E. 215
Pratt Co., Henry 90
Precision Electronics Co. 102
Prescott Tool Co., Inc. 56
Pollard Co., Inc., Jos. G. 80
Pomona Terra-Cotta Co. 62
Porto Pump, Inc. 221
Public Works .....94, 169 & 208

Ranney Method Water Supplies Inc. 69
Reed Mfg. Co. 186
Rensselaer Valve Co. 59
Rhodia Inc. 194
Robert & Co. 215
Roberts Filter Mfg. Co. 96
Rockwell Co., W. S. 190
Rockwell Mfg. Co. .....35 to 38
Roots-Connersville Blower Corp. 191
Royer Foundry & Machine Co. 94
Russell & Axon 215

Seaman-Andwall Corp. .....154, & 155
Seay Co., Irby 215
Shawnee Mfg. Co. 203
Simplex Valve & Meter Co. 88
Skinner Co., M. B. 63
Smith & Gillespie 215
Solvay Process Div. 165
South Bend Foundry Co. 220
Stanley Engineering Co. 215
Stillson Assoc., Alden E. 215

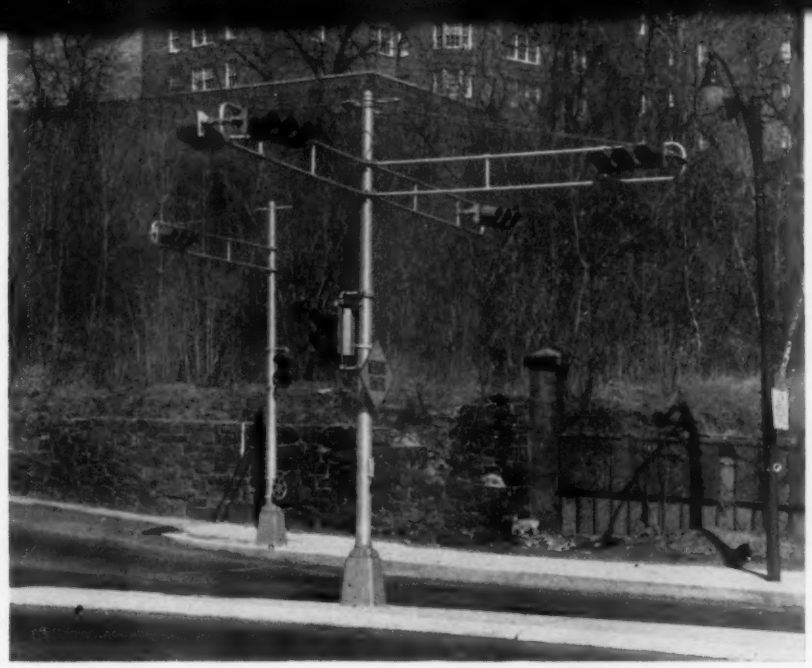
Texas Vitrified Pipe Co. 62
Toledo Pipe Threading Mach. Co. 86
Trickling Filter Floor Institute 62
Turbine Sewer Machine Co. 34

U. S. Pipe & Foundry Co. 189
Uhlmann & Associates 215
Universal Sewer Pipe Corp. 173

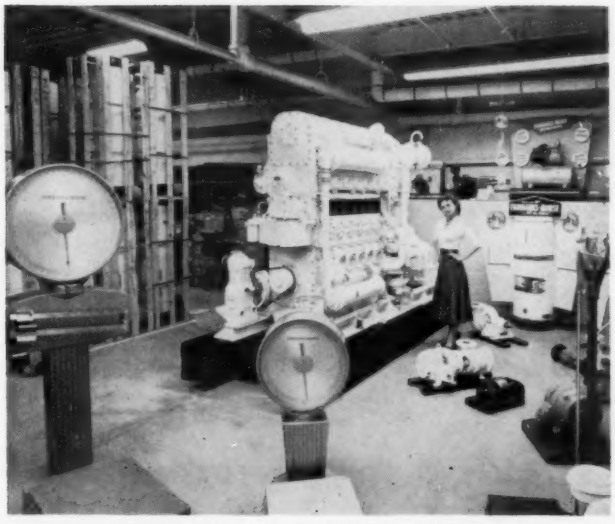
Wachs Company, E. H. 198
Wallace & Tiernan Incorporated ....Back Cover
Water Seals, Inc. 156
Watkins, J. Stephen 215
Wayne Mfg. Co. 17
Westinghouse Electric Corp. .....10 & 11
Whitman, Requardt & Assoc. 215
Willys Motors, Inc. 41
Wolverine Tube
Division Calumet & Hecla, Inc. 177
Wood Co., R. D. 201
Woodward Iron Co. 182
Worthington Corp. 40

Yeomans Brothers Company 181

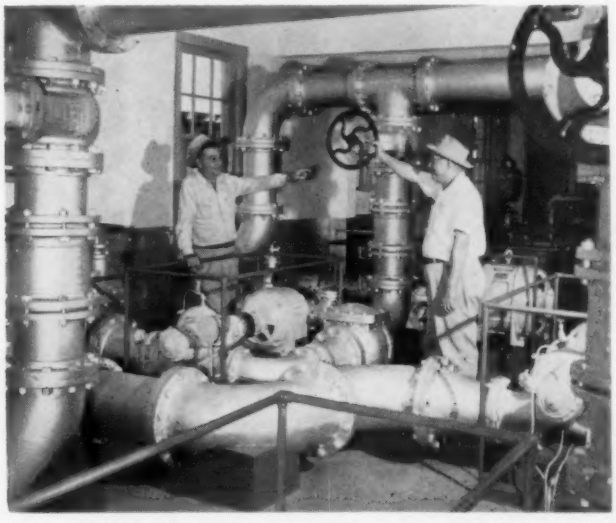
Worth Seeing



These Pfaff and Kendall standard-mounted signals certainly would do for Christmas trees until a better tree comes along. Actually, they are at a complicated intersection in Bloomfield, N. J., just out of P & K's home city of Newark.



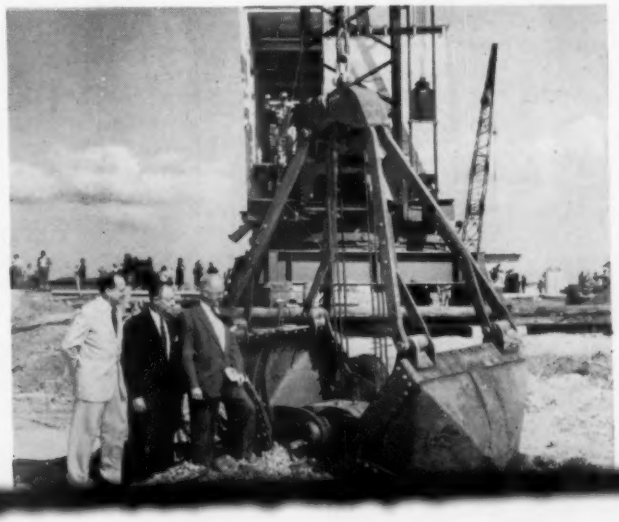
This young lady is admiring a Fairbanks Morse Diesel in that firm's new branch display area at Fairlawn, N. J. and *you* are admiring *her*. So everybody's happy at F-M's opening.



Picture of Paradise—for makers of valves and fittings. This is a corner of the Hollywood, Fla., softening plant which is described in some detail on pages 137 and 138 of this issue.

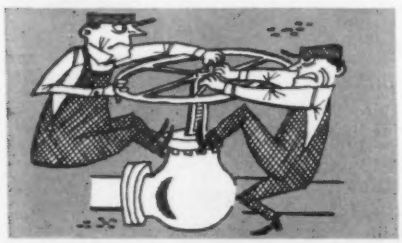
Deputy Comr. **Dwight T. Meyers,** chief engineer of the New York City Traffic Dept., examining freshly-laid "Veon" permanent crosswalk safety line—part of 85,000 ft. to go down.

Mayor Morrison (l.) watches Dravo Corp. (Pittsburgh) break ground for new $65,000,000 Mississippi River bridge in New Orleans. Includes 4 piers, one high as a 34-story building.

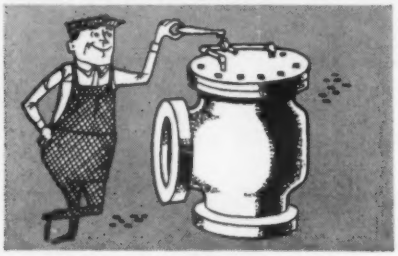


Do you have to operate your PLUG VALVE like this?

Or do you have to use Two Men to operate your GATE VALVE like this?



then install the G-A FLOWTROL VALVE which can be operated LIKE THIS



Standard-built for pressures up to 300 psi
Built to order for higher pressures
Sizes 2" to 36"
WRITE FOR TECHNICAL FACTS TODAY

GOLDEN ANDERSON Valve Specialty Company
1244 RIDGE AVE., PITTSBURGH 33, PA.
Designers and Manufacturers of VALVES FOR AUTOMATION

WORTH TELLING

by Arthur K. Akers

★ OVER 100 good items and pictures received for this column this month . . . room for 20 . . . filling us with sympathy for the frustrated chameleon who died trying to make good on a piece of Scotch plaid cloth.

★ H. P. BONCHER, general manager, Dresser Manufacturing Division, Bradford, Pa., moves upward and westward, to operating vice president, Dresser Industries, Dallas. F. G. Fabian, his former assistant, succeeds him in Bradford.

★ ROCKWELL MANUFACTURING CO., Pittsburgh, opened a new water meter plant at Uniontown, Pa., with 81,500 square feet of manufacturing space filled with modern equipment.

★ KERRIGAN IRON WORKS, Nashville, promotes R. F. Jennings to director safety and personnel.

GORDON P. VEGA is upped to manager of commercial research, Enterprise Engine and Machinery Co., San Francisco.

★ THE FOXBORO CO. announces C. C. Fuller, vice president; H. O. Ehrisman, general sales manager.

★ WHITE MOTOR CO. receives special citation, services to trucking industry.

★ LOCK JOINT PIPE CO. honors us with one of their 50th anniversary medallions.

★ LINK-BELT CO. names Dwight H. Renfrew chief engineer, William A. Morley, general superintendent, Philadelphia plant.

★GROTELIGHT MFG. CO., Bellevue, Ky., featured their unique 8-foot "viewing tunnel" at the new Orleans ARBA, demonstrating reflectorized STOP signs. We stopped.

★ DORR-OLIVER Inc. relocates their Chicago office, in the Merchandise Mart; opens a new one in Midland Building, Cleveland.

★ UNION METAL MFG. CO., Canton, O., (lighting and traffic signal standards) appoints A. W. Crary and G. C. Buchanan district representatives in the Southwest.

★ ROBERT S. STEVENSON succeeds the late W. A. Roberts as president, Allis-Chalmers Mfg. Co., A. E. Thode succeeds H. J. Masuhr in A-C's advertising management.

★ GLEN GRAF succeeds Richard Koehler as advertising manager Le Roi Division, Westinghouse Air Brake Co.

★ KRASS KESTIN is new general sales manager Veon Chemical Corp. (traffic line markings), Long Island City, N. Y.

★ ADD INVITATIONS we would like to have accepted: to Fairbanks-Morse and Company's luncheon and buffet supper in West Palm Beach, Fla., in connection with starting of the world's largest low level pumping station at Twenty Mile Bend nearby.

★ GILBERT M. SCHUCHT is now president and sales manager of The Empire Corporation of Milwaukee, makers of engine generator sets. Distribution outlets are being expanded.

★ AT ARMCO Drainage and Metal Products, Inc., J. E. Kunkler becomes Southwestern Division sales manager at Houston. J. B. Evans succeeds him in Southern California.

★ THE FOUR WHEEL DRIVE AUTO CO. of Clintonville, Wis., names Arthur J. Laack manager of advertising and sales promotion.

★ AMERICAN BITUMULS & ASPHALT CO., San Francisco, have started construction of another new asphalt distribution terminal, at Springdale, Pa., near Pittsburgh.

★ SEE YOU in Chicago, at the American Water Works Convention, June 12-17, we hope!

★ A SHOTGUN WEDDING is a case of wife or death.

—McWane Pipe Pointers

The Safest Meter to Buy—
AMERICAN

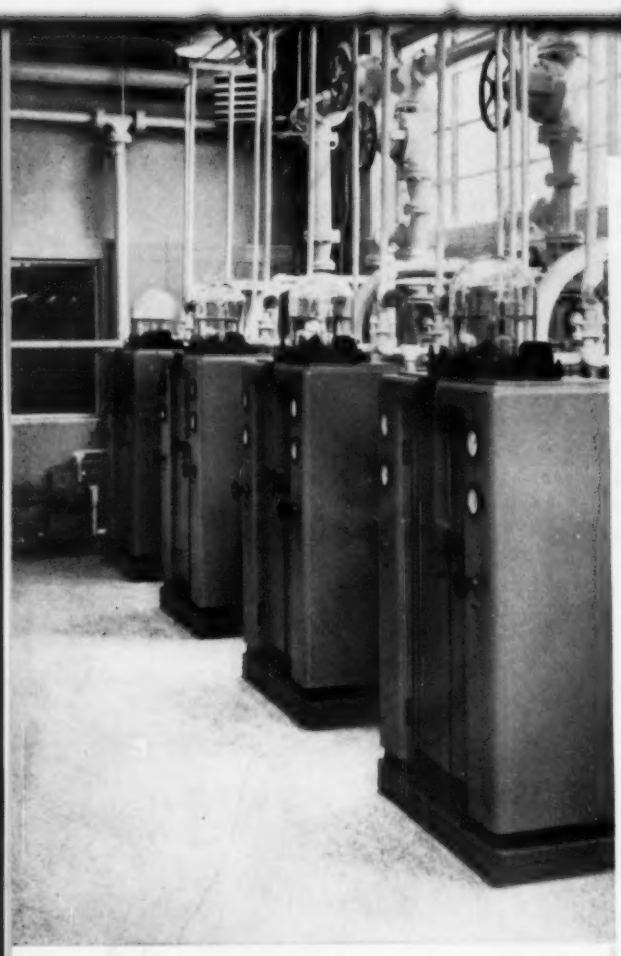
Because it's SO ACCURATE

"American Meters assure full revenue for all the water we pump because they register so accurately, even on the smallest flow. That's why, as Superintendent, I feel safe when I buy American."

• Repeated tests show American Meters sustain their accuracy for many years. Their unusual performance is due to the thicker measuring disc used only in American Meters. It forms a more efficient seal against slippage. The purpose of a meter is to measure the water. The safest meter to measure **all of it**, is American.

BUFFALO METER CO.

2920 MAIN STREET • BUFFALO 14, N. Y.



CITY OF HOUSTON

ROY HOFHEINZ, *Mayor*

UTILITIES DEPARTMENT

San Jacinto Water System
12555 Clinton Drive
Houston 15, Texas
January 13, 1955

Wallace and Tiernan
1112 National City Bank Building
Dallas, Texas

Gentlemen:

The initial installation of 14 Wallace and Tiernan Water Diaphragm Chlorinators in Houston was made in mid-1929 under my supervision. Since that time the number of your chlorinators has increased to 35 at the present time.

The most recent installation was last year in your furnishing and installing four 6000 lb. per day Chlorinators at the Houston Water Purification Plant.

In addition to Wallace and Tiernan Chlorinators, we have 7 of your Chlorine Residual Recorders which were installed under my direction.

In our dealings with your organization for more than a quarter of a century we have relied on your personnel for service and technical advice and to this time have not been disappointed. Your equipment has stood the test of time and has been used under many adverse conditions and always with satisfactory performance.

Very truly yours,

Clyde R. Harvill

Clyde R. Harvill
Superintendent
San Jacinto Water System

W&T WATER DIAPHRAGM EQUIPMENT

"...has stood the test of time..."

At Houston's San Jacinto Water System, W&T equipment — some of which is shown above — "has stood the test of time and has been used under many adverse conditions and always with satisfactory performance," according to Mr. Clyde R. Harvill, Superintendent. This dependability and long life result not only from proper design, but from the selection of the right parts and materials for every specific purpose.

Since 1913, W&T research has consistently sought out new designs, principles and materials. Every new development is placed under rigid field tests to prove it can meet the exacting standards that dependable and economical chlorination demands.

When you depend on W&T equipment, you have the assurance that 40 years of experience in the chlorination field is being used to bring you the best in design, parts and materials — selected to stand the test of time.

"Make Your First Choice Equipment That Lasts."

WALLACE & TIERNAN INCORPORATED

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